Package 'cwhmisc'

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Description Miscellaneous useful functions collected over time

License GPL (>= 2)

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R topics documented:

cwhmisc-package . . . 3
adaptlob . . . 3
astroC . . . 5
astroGeo . . . 6
cap . . . 7
clean.na . . . 8
Const . . . 9
convert . . . 9
cpos . . . 12
datetime . . . 13
dc . . . 13
delayt . . . 15
delstr . . . 15
div.prot . . . 16
dt2str . . . 17

ellipse . . . 18
eql . . . 19
f.log . . . 20
FinneyCorr . . . 21
formatFix . . . 22
frac . . . 23
functions . . . 24
Halton . . . 25
heading . . . 26
interpol . . . 27
invgauss . . . 29
is.constant . . . 29
jitterNA . . . 30
lengths.angle . . . 30
libs . . . 31
lowess.bygroup . . . 32
lpr . . . 32
ls.functions . . . 33
mult.fig.p . . . 33
my.table . . . 35
n22dig . . . 36
n2c . . . 37
num.ident . . . 38
num2Latex . . . 39
numberof . . . 40
numeric . . . 40
padding . . . 41
panel . . . 42
pasteInfix . . . 42
pasteRound . . . 43
plotSymbols . . . 44
plt . . . 45
pointfit . . . 47
printP . . . 49
progress.meter . . . 51
qnorm.appr . . . 52
RCA . . . 54
remove.dup.rows . . . 55
replacechar . . . 55
rotL . . . 56
scode . . . 57
select.range . . . 58
seqm . . . 59
setPPT . . . 60
shapiro.wilk.test . . . 60
signp . . . 61
smoothed.df . . . 62
summaryFs . . . 63

T3plot 63
tex.table 64
triplot 66
w.median 67
waitReturn 67
whole.number 68

Index **70**

`cwhmisc-package` *A collection of useful functions and constants*

Description

Useful functions and constants for mathematics, astronomy, plotting, printing, data manipulation, statistics, string manipulation, etc.

Details

Package:	cwhmisc
Type:	Package
Version:	1.0
Date:	2012-12-27
License:	GPL (>= 2)
Author:	Christian W. Hoffmann <christian@echoffmann.ch>
Maintainer:	same

`adaptlob` *Numerically evaluate integral using adaptive rules.*

Description

`adaptsim` and `adaptlob` approximate the integral of the function `f` using *adaptive* Simpson and Lobatto rule. Both methods can deal with discontinuous functions.
`adaptlob` is more efficient than `adaptsim` when the accuracy requirement is high. For lower tolerances, `adaptsim` is generally (but not always) more efficient than `adaptlob`, but less reliable. Both routines show excellent response to changes in the tolerance.
The function `f` must return a vector of output values if given a vector of input values.
`adapt...(f,a,b)` approximates the integral of `f(x)` from `a` to `b` to *machine* precision.
`adapt...(f,a,b,tol)` integrates to a *relative* error of tol.
`adapt...(f,a,b,tol,trace=TRUE)` displays the stepwise left
end point of the current interval, the interval length, and the partial integral.
`adapt...(f,a,b,tol,trace,P1,P2,...)` allows coefficients P1, ... to be passed directly to the function f: g <- f(x,P1,P2,...)

Usage

```
adaptsim(f, a,b,tol=.Machine$double.eps,trace=FALSE,...)
adaptlob(f, a,b,tol=.Machine$double.eps,trace=FALSE,...)
XXXadaptsimstp(f,term,a,b,fa,fm,fb,is,trace,...)
XXXadaptlobstp(f,term,a,b,fa,fb,is,trace,...)
```

Arguments

f	function to be integrated.
a	starting abscissa of integral.
b	ending abscissa of integral.
tol	tolerance for termination
trace	should intermediate steps be traced
term	whether the termination criterion is fulfilled
fa,fb,fm	function values at a, b, (a+b)/2
is	error representative
...	additional parameters for function f.

Value

List (Q, term) with Q = the approximate value of the integral and term = the information, whether the tolerance given was too small.

Note

Functions XXX.. are internal to adapt.. and should not be used explicitely.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Source

Walter Gautschi, 08/03/98. Reference: Gander, Computermathematik, Birkhaeuser, 1992.

References

Gander, W., Gautschi, W., 2000. Adaptive Quadrature - Revisited. ETH Zurich, DI IWR technical report 306. BIT 40, 1, 84–101.

Examples

```
options(digits=7)
FexGander <- function(xx) ifelse(xx < 1,xx+1,ifelse(xx <= 3, 3 - xx, 2 ))
adaptsim(sin,0,pi,2.0e-3,TRUE)$Q - 2.0 #   -1.686905e-05
adaptsim(sin,0,pi,2.0e-23)$Q - 2.0  # 0
adaptsim(FexGander,0,5)$Q - 7.5 # -7.993606e-15 instead of 0
```

```
adaptlob(FexGander,0,5,2.0e-6,TRUE) # 7.500002 instead of 7.5
adaptlob(FexGander,0,5,2.0e-6)$Q - 7.5 #  1.781274e-06 instead of 0
adaptlob(FexGander,0,5)$Q-7.5 #   instead of  -8.881784e-16, with warnings
#  that required tolerance is too small.
adaptlob(FexGander,0,5,5.0*.Machine$double.eps)$Q-7.5 #  -5.329071e-15
```

`astroC` *Astronomical constants*

Description

Astronomical constants

Details

`cJDJ2000` = 2451545.0 , Julian day number of the epoch J2000.0
`cDAYPJULCENT` = 36525.0 , days per julian century
`cDAYPYEARTROP` = 365.242198781 , days per tropical year
`cDAYPYEARSID` = 365.25636042 , days per sidereal year
`cDAYPMONSYN` = 29.53058868 , days per synodical month
`cDAYPMONSID` = 27.321655 , days per sidereal month
`cK` = 0.01720209895 , Gravitational constant, GAUSSian defintion
`cC` = 299792458.0 , [m/s] defined speed of light
`cRE` = 6378140.0 , [m] radius of earth.s equator
`cMY` = 0.01230002 , ratio mass of moon/mass of earth
`cPRECESS` = 5029.0966 , [arc sec] praezession per year at 2000.0
`cEPSOBL`23.43929111 , [deg] inclination of ecliptic at 2000.0
`cAE` = 1.49597870E11 , [m] distance Earth to Sun
`cSBYE` = 332946.0 , ratio mass of Sun/mass of Earth
`cSBYEMY` = 328900.5 , ratio mass of Sun/mass of, Earth+Moon
`cSBYME` = 6023600.0 , ratio mass of Sun/mass of Mercury
`cSBYVE` = 408523.5 , ratio mass of Sun/mass of Venus
`cSBYMA` = 3098710.0 , ratio mass of Sun/mass of Mars
`cSBYJU` = 1047.355 , ratio mass of Sun/mass of Jupiter
`cSBYSA` = 3498.5 , ratio mass of Sun/mass of Saturn
`cSBYUR` = 22869.0 , ratio mass of Sun/mass of Uranus
`cSBYNE` = 19314.0 , ratio mass of Sun/mass of Neptun
`cSBYPL` = 130000000.0 , ratio mass of Sun/mass of Pluto
`cSOLBYSID` = 1.00273790934 , ratio solar/sidereal day
`cSIDBYSOL` = 0.99726956634 , ratio sidereal/solar day
`DPY` = cDAYPJULCENT/100.0; Tage/jul.Jahr
`DAYINMONTH` = c(31,28,31,30,31,30,31,31,30,31,30,31,31)

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

astroGeo *Convert geographical coordinates to and from Swiss topo coordinates*

Description

Geographic and Swiss topo rectangular coordinates, X positive to the north, Y positive to the east (!)

Usage

```
LB2MK( long, lat )
LB2YX( long, lat )
YX2LB( yToEast, xToNorth )
YX2MK( yToEast, xToNorth )
```

Arguments

`long,lat, yToEast, xToNorth`
Real

Details

`LB2MK` From geogr. longitude and latitude to planar meridian convergence [gon].
`LB2YX` From geogr. longitude and latitude to Swiss coordinates.
`YX2LB` From Swiss coordinates to geogr. longitude and latitude.
`YX2MK` From Swiss coordinates North and East to planar meridian convergence [gon].
`LongBerne, LatBerne` geogr. coordinates of Berne, 7deg26'22.50" east, 46deg57'08.66" north.
`yToEastBerne, xToNorthBerne` Swiss topo coordinates of refernce point near Berne.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch> after H.Matthias, lecture 'Amtliche Vermessungswerke 1', ETH Zurich, 1986.

Examples

```
LB2MK( LongBerne, LatBerne) #  7.21188e-16 [gon]
LB2MK( 9.132582913360895, 46.18669420448755) # somewhere in Switzerlan , 1.37472
LB2YX( LongBerne, LatBerne) # 600.0, 200.0
YX2LB ( yToEastBerne, xToNorthBerne ) # 7.439583333333334  4695240555555557
YX2MK ( 600, 200) #  =   0
```

cap *Change case of strings*

Description

capply apply function to elements in character vector (utility function) cap and capitalize change to capital letters. lower and lowerize change to lower case letters. CapLeading Capitalizes the first character of each element of a character vector XXXcl used in capitalize and lowerize

Usage

```
capply(str,ff,...)
cap(char)
capitalize(str)
lower(char)
lowerize(str)
CapLeading(str)
XXXcl(str, ff)
```

Arguments

str	a character vector.
ff	a function.
char	a single letter.
...	additional parameters for function ff.

Value

The same as the argument.

Note

capply has been reverse engineered from the help page on strsplit: strReverse <- function(x) sapply(lapply(strsplit(x, NULL), rev), paste, collapse="") can be written as capply(x, rev)

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
# capitalize shows the use of capply
cap("f")    # "F"
capitalize(c("TruE","faLSe"))  # "TRUE"  "FALSE"
lower("R")  # "r"
lowerize("TruE")  # "true"
CapLeading(c("all you ","need"))     # "All you " "Need"
capply(c("abc", "elephant"), rev)  # "cba"    "tnahpele"
```

clean.na *Clean a matrix or data frame of rows or columns of containing NA.*

Description

clean.na Eliminate rows or columns containing NA.

Usage

```
clean.na(x,margin,drop=FALSE)
```

Arguments

x	A matrix.
margin	= 1 for rows, = 2 for columns
drop	= FALSE (default) if result should be a matrix even if it contains only one row or column.

Value

The matrix without the offending rows or columns.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

See Also

drop.

Examples

```
  x <- matrix(c(1,NA,2,5),2,2)
  clean.na(x,1)
#     [,1] [,2]
#[1,]    1    2
  clean.na(x,2,TRUE)
# [1] 2 5
```

Const *Constants*

Description

Elementary constants and 'GreatestIntAsRealF': determination of the greatest integer K which is distiguishable from (K+1), both represented as real

Details

cE = 2.718281828459045235 ## e
cLOG2E = 1.442695040888963407 ## log(basis 2) of e
cLOG10E = 0.4342944819032518277 ## log(basis 10) of e
cLN2 = 0.6931471805599453094 ## log(basis e) of 2
LN10 = 2.302585092994045684 ## log(basis e) of 10
c2PI = 6.283185307179586477 ## 2pi
cPIBY2 = 1.570796326794896619 ## pi/2
cPIBY4 = 0.7853981633974483096 ## pi/4
c1BYPI = 0.3183098861837906715 ## 1/pi
c2BYPI = 0.6366197723675813431 ## 2/pi
c1BYSQRTPI = 0.5641895835477562869 ## 1/sqrt(pi)
c2BYSQRTPI = 1.12837917095512574 ## 2/sqrt(pi)
cSQRT2 = 1.414213562373095049 ## sqrt(2)
cSQRT2BY2 = 0.7071067811865475244 ## sqrt(2)/2
cMAXREALBY3Q = .Machine$double.xmax^0.75
cMAXREALBY38 = sqrt(cMAXREALBY3Q)
GreatestIntAsRealF Greatest integer K which is distiguishable from (K+1), both represented as real
ASCII = ASCII characters corresponding to (0), 1..256
HexDig = '1' - '9', 'A' - 'F'
spacC = " ", is extra space in indexLine and charMat
PRIMES The first 115 primes

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

convert *Test, convert numbers*

Description

Functions for testing strings, for conversion of integers to bases other than decimal as string representations

Usage

```
allDigits( str )
isNumeric(str)
intToASCII(i)
intToBase( i, base=2 )
intToOct( i )
intToHex( i )
contfrac( x, depth = 13, f=floor )
evalcfr( cf )
toFrac( x, depth)
str2dig( str )
int( x )

xToBase( x, base=2 )
int( x )
Hd( h, m, s )
Hdms( hd )
Hmsd( hms )
Degree( radian )
Radian( degree )
ReduceArc( U, ref )
ReduceArc2(U, V, ref )
ToPolar( x, y )
ToRect( r, p )
```

Arguments

i,base,depth	Integer
x,y,r,p,h,m,s,hd,hms,U,V,ref,radian,degree	Real
f	function to use, normally 'floor', otherwise 'round' or 'trunc'
cf	Vector of integers representing the continued fraction of areal number
str	String

Details

alldigits Convert a string to a number literally.
isNumeric Test whether the elements of a character vector represent legal numbers only. intToASCII Show character or octal representation at a place in the ASCII sequence.
intToBase Convert an integer number to string representation in a base between 2 and 16 inclusive.
intToOct Convert integer to octal representation.
intToHex Convert integer to hex representation.
contfrac Convert to continued fraction representation.
evalcfr Evaluate continued fraction to corresponding real.
toFrac Build rational approximation num/den to x using forward continued fraction recursion to a depth of depth. Stopping criterion: either depth is reached, or abs(x - num/den) is increasing again.

`str2dig` Convert a string to a vector of integers.
`int` truncate towards 0.
`xToBase` return `res$a`, `res$e` so that x = a*base^e, abs(a) in [1, base)
`sqr` x^2.
`Hd` Return hours from h, min, sec.
`Hms` Return h, min, sec from hours, is inverse of Hd.
`Hdms` Return hh.mmss from hours.
`Hmsd` Decimal hours from hours.mmss, is inverse of Hdms.
`Degree` Convert radians to degrees.
`Radian` Convert degrees to radians.
`ReduceArc` Add or subtract multiples of ref to make $abs(U) < ref/2$.
`ReduceArc2` Subtract from `U` and `V` the greatest multiple of ref, so that $0 <= minU_new, V_new < ref$.
`ToPolar`,`ToRect` Convert rectangular into polar coordinates and vice versa. Further explanation in function code.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
allDigits(c("1231","89a8742")) #  TRUE FALSE
isNumeric(c("1231","8.9e-2",".7d2")) # [1]  TRUE  TRUE FALSE
intToASCII(1:255)[121:129] # "x"   "y"   "z"   "{"   "|"   "}"   "~"   "\177" "\200"
sapply(1:50,intToBase,2)
sapply(1:50,intToBase,7)
sapply(1:50,intToOct)
sapply(1:50,intToHex)
(pcf <- contfrac(pi)) # 3, 7, 15, 1, 292, 1, 1, 1, 2, 1, 3, 1, 14, 2, (1)
## last integer incorrect due to rounding errors
evalcfr(pcf)-pi # 0
str2dig("10010") # [1] 1 0 0 1 0
int(10^(7:10)) # 10000000 100000000 1000000000 NA
gcd(35,133) # 7
x <- exp(2.1)
xToBase(x,2);xToBase(x,3);xToBase(x,4) # 8.16617 =  1.02077*2^3 = 2.72206*3^1 = 2.04154*4^1
Hd( 12,25,17) # 12.421389
Hms(1.421389) # $h  1, $m 25, $s 17.0004
Hmsd(1.421389) # 1h 42m 13.89 -> 1.703858
Hdms(1.703858) # 1.421389
Degree(pi/2)  # 90
Radian(180)  #  3.141593
ReduceArc(580,360) # -140
ReduceArc2(200,120,70) # 130, 50
ReduceArc2(100,-200,70) # 310, 10
ToPolar(1.0, 1.0) # $r 1.41421, $p 0.785398
ToRect(2.0,pi) # $x -2, $y 2.44921e-16
```

cpos *Find the position of a substring*

Description

cpos finds the first position of a substring substring.location returns a list with starting and ending positions, works only with a single string.

Usage

```
cpos(str,sub,start=1)
substring.location(str, sub, restrict)
```

Arguments

str	string)
sub	string)
start	integer
restrict	vector of lower and upper index the search should be restricted to

Value

cpos number, if found, NA otherwise.
substring.location list(first,last) for each occurrence
If there is none first=NA,last=NA.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
cpos(" Baldrian","a",5) #  8
cpos("Baldrian","B",15) # NA
substring.location("In,theese,housees,there,are,rats","ees")
#$first  [1]  6 15
#$last   [1]  8 17
```

datetime *Show date and time in ISO format*

Description

`datetime()` outputs date and time in ISO format

Usage

```
datetime(); mydate(); mytime()
```

Arguments

	none

Value

character string

Note

These functions are implemented using POSIX

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
datetime()  #[1] "2012-09-27, 13:56:38"
mydate()  #[1] "2012-09-27"
mytime()  #[1] "13:56:39"
```

dc *Convert number for table columns, for equations*

Description

Convert number
- for use in decimal dot centered table columns: Replace "." in a number by "&" for LaTeX tables using column specification r\@{.}l.
- `mpf(r,n)` returns "+ r" or "- r", depending on the sign of `r`, with `n` decimal digits. Useful in `Sweave` files *.Rnw for composing text for linear combinations with coefficients shown in \Sexp.

Usage

```
dc (x,d,ch="&")
dcn(x,d,ch="&")
mpf(r,after)
```

Arguments

x	Numerical vector.
d	Number of decimals after ".". d >= 1, will be forced internally.
ch	Substitute "." by ch
after	See formatFix, the number of decimals after ".".
r	real value.

Value

string representation of x suitable for table column centered on "."

Note

dc = dcn, except for `x = integer .`

dc uses frac, dcn uses sprintf.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
  nn <- c(0, 1, 0.1, pi,2*pi,-30*pi)
  dc(nn,3)    # "0&0"     "1&0"     "0&100"   "3&142"   "6&283"   "-94&248"
  dcn(nn,3)   # "0&000"   "1&000"   "0&100"   "3&142"   "6&283"   "-94&248"
  mpf(pi,5); mpf(-pi,5)  # "+ 3.14159" "- 3.14159"  Note the space after the sign.

#### In example file 'T.Rnw':
##  <<echo=TRUE>>=
a <- -2; b <- -4; c <- 7
##  @
##
##  The coefficients are: $a = \Sexpr{a}$, $b = \Sexpr{b}$, $c = \Sexpr{c}$.
##

##  For the linear combination $$z = a + bx +cy$$ we have
##   $$z = \Sexpr{sprintf(%.4f,a)} \Sexpr{mpf(b,3)} x \Sexpr{mpf(c,5)} y$$
#### end T.Rnw
###  Sweave: T.Rnw .. T.tex .. T.dvi
```

delayt *Waiting loop for program execution*

Description

Wait for approximately sec seconds during program execution

Usage

```
delayt(sec) # wait for sec seconds
```

Arguments

sec	Number of seconds to wait

Details

calls Sys.time()

Value

the number of internal calls of Sys.time()

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
Sys.time(); nrof <- delayt(5); Sys.time()
print(nrof) # 2620 on my machine
```

delstr *Delete a substring from a string*

Description

delstr deletes a substring from a string

Usage

```
delstr(str,del)
```

Arguments

str	a string, may be empty, string to be edited
del	a string, may be empty, string to be taken out.

Value

A string

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
delstr("Ich gehen heuten in den Garten hinein","en")
#  "Ich geh heut in d Gart hinein"
delstr("12345","x") # "12345"
```

---

div.prot *Protected division*

Description

num/den, but num/0 -> .Machine$double.xmax^(3/4)

Usage

```
div.prot(num,den)
```

Arguments

den,num	real, numerator and denominator

Value

num/den, if is.infinite(num/den) then .Machine$double.xmax^(3/4), the ^(3/4) for getting something well below Inf.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
de <- .Machine$double.eps
v<-c(0,de/c(1,2,4,8))
div.prot(1,v)
#  1.55252e+231  4.50360e+15  9.00720e+15  1.80144e+16  3.60288e+16
```

dt2str *Convert time difference to string.*

Description

Convert time difference in seconds to string depending on switch.

Usage

```
dt2str(dt,dec=0,verbose=FALSE)
```

Arguments

dt	Time difference in seconds
dec	Places in decimal fraction of seconds
verbose	If TRUE, then delimited by "hours minutes seconds", else by ":"

Value

String representing the time difference, with dec decimals in seconds.

Note

Enclosing the above statements in a function is likely to show zero time.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
t1 <- unclass(Sys.time())
x <- 0;  for (i in 1:1.e6) x <- x+1
t2 <- unclass(Sys.time())
dt2str(t2-t1,3) # 00:00:2.835
```

`ellipse` *Generate ellipses*

Description

Given the axes `a, b` and an angle `phi` (in radian, counter clockwise), and the midpoint coordinates `m`, points on the ellipse $(y-m)' * A^{(-1)} * (y-m) = cn^2$ with $A = rotL(phi, 2, 1, 2) * matrix(c(a, 0, 0, b), 2, 2)$ will be generated, see `rotL`.

Usage

```
ellipse(k, m, a, b, phi, mlt = 1.0 )
conf.ellipse(k, m, a, b, phi, df1, df2, level = 0.95)
```

Arguments

`k`	the number of generated points on the ellipse.
`m`	vector c(x, y) containing the midpoint coordinates of the ellipse.
`mlt`	(positive) expansion factor for axes.
`a`	major axis
`b`	minor axis
`phi`	angle in radian describing the counter clockwise rotation from the x-axis to the major axis.
`df1, df2, level`	degrees of freedom and probability level of F-distribution.

Value

`ellipse` The matrix with columns consisting of the x and y coordinates of the ellipse. `conf.ellipse` The matrix with columns consisting of the x and y coordinates of the confidence ellipse according to `qf(level, df1, df2)`, see `qf`.

Author(s)

Christian W. Hoffmann <christian.hoffmann@wsl.ch>

Examples

```
  m <- c(2,7); a<-5; b<-2; phi<-pi/7
  df1 <- 2; df2 <- 20
# show F for different confidence levels:
  p <- c(0.5, 0.75, 0.8, 0.95)
  qf(p, df1, df2) #  0.717735 1.486984 1.746189 3.492828
 # error in check but not in direct execution
  el7 <- conf.ellipse(60,m,a,b,phi,df1,df2,p[2])
  plot(el7,type="n",xlab="",ylab="")
```

```
lines(conf.ellipse(60,m,a,b,phi,df1,df2,p[1]),lty=2,col="red")
lines(conf.ellipse(60,m,a,b,phi,df1,df2,p[3]),lty=2,col="green")
lines(conf.ellipse(60,m,a,b,phi,df1,df2,p[4]),lty=2,col="blue")
lines(el7,lty=2,col="orange")
legend(x="bottom",paste(as.character(p*100),rep("%",length(p)),
  sep=""), col = c("red", "orange","green","blue"), text.col=
  "black", lty = c(2,2,2,2), merge = TRUE, bg='white', cex=0.9)
```

`eql` *Check on equality, including NA==NA and NaN==NaN.*

Description

`my.table` checks two vectors on equality, two NA's and two NaN's compare as equal.

Usage

```
eql(x, y)
```

Arguments

`x, y`	vectors of equal length.

Value

A vector of logicals indicating the result of the element by element comparison.The elements of shorter vectors are recycled as necessary.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>,
idea by Peter Dalgaard, <p.dalgaard@biostat.ku.dk>

Examples

```
eql(c(1,2,3),c(1,3)) #>  TRUE FALSE FALSE
eql(c(1,2,3),c(1,2)) #>  TRUE  TRUE FALSE
eql(c(NA,NaN,2,NA,3),c(NA,NaN,1,2,3)) #>  TRUE  TRUE FALSE FALSE
```

`f.log` *Determine an optimized offset s and return log10(data+s).*

Description

`f.log` determines a positive offset `s` for zero values to be used in a subsequent log transformation.

Usage

```
f.log(x)
```

Arguments

`x`	vector of data.

Value

The transformed values log10(data + s).

Note

The value for the offset `s` is optimized to render the transformed values of `x` log-normal

Author(s)

W.Stahel, ETH Zuerich, <werner.stahel@stat.math.ethz.ch> adapted by: Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
x <- c(rep(0,20), exp(rnorm(1000)))
fx <- f.log(x)
oldpar <- par(mfrow = c(2, 3))
plot(x)
qqnorm(x)
T3plot(x)
plot(fx)
qqnorm(fx)
T3plot(fx)
par(oldpar)
```

FinneyCorr *Finney's correction to log normally distributed data, r-squared and standard deviation of a linear model.*

Description

FinneyCorr: Finney's correction factor K in $latex$ (see Note), to be used if $\ln x$ is normally distributed with standard deviation $latex$. FC.lm, R2.lm, s.lm: Finney's correction, R^2 and standard deviation extracted from an object of class "lm".

Usage

```
FinneyCorr(s,n)
FC.lm(lmobj)
R2.lm(lmobj)
s.lm(lmobj)
```

Arguments

s	Standard deviation of log data, $s_{\ln}$ in note.
n	Number of data points.
lmobj	An object of class "lm".

Note

$latex$

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

References

Finney D.J., 1941. On the distribution of a variable whose logarithm is normally distributed. J. R. Stat. Soc., B 7: 155-161

Examples

```
FinneyCorr(0.346274,24+3)  #  1.059306936

ok <- RNGkind()
RNGkind(kind = "default", normal.kind = "default")
set.seed(2009, kind = "default")
x <- rnorm(1000); y <- 0.1*rnorm(1000)
## Reset:
RNGkind(ok[1])

lmo <- lm(y ~ x)
```

```
FC.lm(lmo)  # 1.00472
R2.lm(lmo)  # 6.1926e-05
s.lm(lmo)   # 0.0970954
```

`formatFix` *Format to a fixed format representation*

Description

`formatFix` formats to fixed point number format. It 'writes' `x` with sign (" " or "-"), with `before` decimals before the "." and with `after` decimals after the ".". If `after == 0` then the "." will be omitted.
There will always be at least one decimal digit before the "."
If `before` is too small to represent `x`: if `extend==TRUE`, the string will be extended, else a string consisting of "*" of length `before+after` will be given.
If $abs(x) >= 10^8$, values very near 10^k cannot be represented exactly, so the normal `format` will be used.
Names are retained.

Usage

```
formatFix(x,after,before=2,extend=TRUE)
```

Arguments

`x`	The number to be represented.
`after`	The number of decimals after ".".
`before`	The minimum number of decimals before ".".
`extend`	Extend string if necessary.

Value

The string representing the fixed point format of `x`.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
xxbig <- c(1.2e9,3.51e23,6.72e120,NaN)
xx    <- c(0.001,92,exp(1),1000*pi)
formatFix(c(-rev(xxbig),-rev(xx),0,NA,xx,xxbig),0,3)
#> [1] "    NaN" "-7e+120" " -4e+23" " -1e+09" "  -3142" "     -3" "    -92"
#> [8] "     -0" "      0" "     NA" "      0" "     92" "      3" "   3142"
#> [15] "  1e+09" "  4e+23" " 7e+120" "    NaN"
formatFix(c(-rev(xxbig),-rev(xx),0,NA,xx,xxbig),0,3,FALSE)
#> [1] "NaN" "***" "***" "***" "***" " -3" "-92" " -0" "  0" " NA" "  0" " 92"
```

```
#> [13] "  3" "***" "***" "***" "***" "NaN"
formatFix(c(-rev(xxbig),-rev(xx),0,NA,xx,xxbig),6,3)
#> [1] "         NaN" "  -6.72e+120" "   -3.51e+23" "    -1.2e+09" "-3141.592654"
#> [6] "   -2.718282" "  -92.000000" "   -0.001000" "    0.000000" "           NA"
#> [11] "    0.001000" "   92.000000" "    2.718282" " 3141.592654" "     1.2e+09"
#> [16] "    3.51e+23" "   6.72e+120" "         NaN"
formatFix(c(-rev(xxbig),-rev(xx),0,NA,xx,xxbig),6,3,FALSE)
#> [1] "       NaN" "-6.72e+120" " -3.51e+23" "  -1.2e+09" "**********"
#> [6] " -2.718282" "-92.000000" " -0.001000" "  0.000000" "        NA"
#> [11] "  0.001000" " 92.000000" "  2.718282" "**********" "   1.2e+09"
#> [16] "  3.51e+23" " 6.72e+120" "       NaN"
```

`frac` *Fractional part of number*

Description

Split off fractional part of a number

Usage

```
frac(x,d)
```

Arguments

x	Numerical vector.
d	If not missing, determines number of decimals after "."

Value

fractional part, if d is missing; else $round(10^d * fractionalpart)$, i.e. the digits without the leading "0.".

Note

d not missing is practical for use in dc

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
frac(c(0,pi,2*pi,30*pi))    # 0.000000 0.141593 0.283185 0.247780
frac(c(0,pi,2*pi,30*pi),3)  # 0 142 283 248
```

functions *Functions for testing and other*

Description

Functions for testing on equality, exactly or with a tolerance, functions usable as parameters in other functions.

Usage

```
modulo( m, n  )
moduloSymm( m, n )
one ( x )
onebyx( x )
sqr( x )
powr( a, x )
equal( x, y )
equalFuzzy( x, y, prec, rel=TRUE )
quotmean(x,y)
safeDiv( num, den )
solveQeq(a,b,c)
inrange(x,r)
IsCounterCl2( U, V, ref )
IsCounterCl3( U, V, W, ref )
ClockSense2( U, V, ref )
ClockSense3( U, V, W, ref )
```

Arguments

m,n,num,den	Integer
a,b,c,prec,r,ref,x,y,U,V,W	Real
rel	Boolean

Details

modulo m moduloSymm (m - (trunc(m/n)*n)), symmetric to 0.
zero Return 0.0
one Return 1.0
onebyx 1.0/x
sqr x^2
powr a^x, with 0^0 := 1, 0^x := 0
equal x == y
equalFuzzy One can choose between relative and absolute precision
safeDiv Compute quotient, safeguard >= cMAXREALBY3Q
quotmean Compute mean of non-NA elementsof x and y
solveQeq Solve the quadratic equation given by the coefficients, return two solutions if a != 0, else

one solution, possibly NA
`inrange` Check if x is in the range r
`CounterClock, NoneClock, Clockwise` "clckws", "Cntclck","noneclck", "clckws"
`ClockSense2` Return the clock sense of U and V
`ClockSense3` Return the clock sense of U, V, W
`IsCounterCl2` Check if the directed angle from U towards W is counter clockwise, including U==W. Ref is the measure of a full circle, 360 for degrees, 2*Pi for radians, 400 for gon
`IsCounterCl3` Check if U, V, W form a counterclock wise sequence.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
modulo((-3:5),4 ) # 1 2 3 0 1 2 3 0 1
moduloSymm((-3:5),4) # -3 -2 -1  0  1  2  3  0  1
x <- 200; y <- x + 0.1
equalFuzzy(x,y,0.1*c(10^(-3:0))) # FALSE  TRUE  TRUE  TRUE
equalFuzzy(x,y,0.1*c(10^(-3:0)),FALSE) # FALSE FALSE FALSE  TRUE
safeDiv(1,0) # 1.552518e+231
solveQeq(0,0,1) # NA NA
solveQeq(0,1,0) # 0
solveQeq(0,1,1) # -1
solveQeq(1,0,0) #  0 0
solveQeq(1,0,1) # 0-1i 0+1i
solveQeq(1,1,0) #  -1  0
solveQeq(1,1,1) #  -0.5-0.866025i  -0.5+0.866025i
solveQeq(sample(1:4,1),sample(1:4,1),sample(1:4,1))
ClockSense2(0,220,360) # "clckws"
ClockSense2(0,170,360) # "Cntclck"
ClockSense2(0,0,360) # "noneclck"
```

`Halton` *Halton's quasi-random numbers*

Description

Generating quasi-random numbers by Halton's radical inversion algorithm.

Usage

```
HS247(K,N,R,P=rep(0,K))
```

Arguments

`K`	Integer, number of random sequences
`N`	Integer, length of the random sequences
`R`	Integer 1..K, roots of inversion, should be prime
`P`	Integer 1..K, starting points of inversion

Value

A matrix of K columns containing the sequences.

Author(s)

Christian W. Hoffmann, <hoffmann@wsl.ch>

Source

J. H. Halton, 1964. Algorithm 247: Radical-inverse quasi-random point sequence, Communications of the ACM, Vol.7,12, pp. 701 - 702 .

References

http://en.wikipedia.org/wiki/Halton_sequences

Examples

```
par(mfrow=c(2,2))
n <- 400
q1 <- HS247(2,400,c(2,2),c(0,pi/10))
q2 <- HS247(2,400,c(2,3))
q3 <- HS247(2,400,c(2,5))
q4 <- HS247(2,400,c(17,19)) # prone to correlations
plot  (q1,pch="+",col="blue",cex=0.5)
points(q2,pch=4,col="green",cex=0.5)
plot  (q2,pch=4,col="green",cex=0.5)
points(q3,pch=":",col="red")
points(q4,pch=4,col="magenta",cex=0.5)
plot  (q2,pch=4,col="green",cex=0.5)
points(HS247(2,400,c(2,3),c(pi/10,pi/10)),pch=5,cex=0.5,col="red")
plot  (HS247(2,400,c(2,3),c(pi/10,pi/10)),pch=5,cex=0.5,col="red")
points(HS247(2,400,c(2,3),c(pi/10+0.2,pi/10+0.2)),pch="-")
```

`heading` *Write a line of text with underlining and blank lines. Useful for line oriented output.*

Description

`heading` writes m blank lines, then `text`, underline with `length(text)` copies of `ch` then write `n` blank lines `comm` can be used as comment character

Usage

```
heading(text, comm = "", ch = "-", m = 1, n = 0)
```

Arguments

text	(one line) text string, if "": only m+n empty lines
comm	optional comment character written at start of text and of underline
ch	character used to underline text, if "": no underline
m	number of empty lines written before text
n	number of empty lines written after underlined text

Value

NULL

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
##  "#|" means the left margin
heading("Very compact","","=",0,1)
##|
heading("","=")  # one blank line only
##|
heading("standard")
##|
##|standard
##|--------
heading("Just a line, not really a heading","","",0,0)
##|Just a line, not really a heading
```

---

interpol *Polynomial and rational interpolation*

Description

Determine the argument of the minimum by polynomial or rational interpolation of given points x, y.

Usage

```
setupInterp(x, y, doPoly = TRUE)
evalInterp(xi, ss)
minInterp(x, y, add = FALSE, doPoly = TRUE)
quadmin(x, y)
```

Arguments

x	vector of x-coordinates
y	vector of y-coordinates
xi	argument x of interpolation
ss	setup given by setupInterp
add	if TRUE, one more point is used than for FALSE (default)
doPoly	if TRUE, polynomial interpolation is used, if FALSE, rational interpolation is used, with three points and four points respectively (latter for add=FALSE)

Value

setupInterp	Generate structure for evaluation in evalInterp
xmin	x-value of the minimum. NA if too few points are given or no minimumm exists in x.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

References

Stoer, J., 1989. Numerische Mathematik 1ed. 5. Springer, Berlin. Applied and Computational Complex Analysis, Vol.2. Wiley,

Examples

```
x <- c(1,2,4,6); y <- 1/x
xP <- setupInterp(x,y,TRUE)
xT <- setupInterp(x,y,FALSE)
x0 <- seq(0,7,0.1); yP <- evalInterp(x0,xP)
yT <- evalInterp(x0,xT)
plot(x,y,xlim=c(-0.5,7.5),ylim=c(min(y)-2,max(y)+2),cex=2)
lines(x0,yP,col=2,cex=0.5)
lines(x0,yT,col=4,cex=0.5,pch="+")
legend(x="bottom",c("polynomial", "rational"), col = c(2,4),
 text.col= "black", lty = 1, merge = TRUE, bg='white')
minInterp(x,(x-3)^2,add=FALSE,doPoly=TRUE) # 3
minInterp(x,(x+1.0/x),add=FALSE,doPoly=FALSE) # 1 -1
minInterp(x,(x+1.0/x),add=TRUE,doPoly=TRUE) # 8.3471982 0.3194685
```

invgauss *Inverse Gaussian Distribution*

Description

Density, cumulative probability, quantiles and random generation for the inverse Gaussian distribution.

Author(s)

Gordon Smyth, <gks@maths.uq.edu.au>

is.constant *is.constant*

Description

A numerical vector consists only of identical values

Usage

```
is.constant(x)
```

Arguments

x	a vector

Value

TRUE if x is numerical and $\max(x) == \min(x)$.

Author(s)

Kjetil Brinchmann Halvorsen, <kjetil@acelerate.com>, expanded by Christian W. Hoffmann <christian.hoffmann@wsl.ch>

See Also

identical, all.equal

Examples

```
is.constant(rep(c(sin(pi/2),1),10)) # TRUE
x <- factor(c(1,1,NA))
is.constant(x)            # FALSE because of NA
is.constant(x[1:2])       # TRUE
is.constant(c(1,1,NA))    # FALSE because of NA
is.constant(c(1,1,2))     # FALSE
is.constant(c(1,1,1))     # TRUE
```

jitterNA *Jitter vector containing NA*

Description

Extension of jitter to deal with NA entries

Usage

```
jitterNA(x,...)
```

Arguments

x	Data to be jittered, may be vector, matrix, or numerical data frame.
...	Other parameters for jitter.

Value

jitterNA(x, ...) return a numeric vector with jittered entries, NA entries are allowed and not changed

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
d <- data.frame(cbind(x=1, y=1:10))
d[5,1] <- d[3,2] <- NA
jitterNA(d)
```

lengths.angle *Lengths of two vectors and angle between them.*

Description

Compute lengths of two vectors and the angle between them.

Usage

```
lengths.angle(x, y)
```

Arguments

x	the first vector. Alternatively, a single matrix with both vectors as *columns* can be provided.
y	the second vector, *optional* if x is an appropriate structure.

Value

A list with elements

lx	the length of x.
ly	the length of y.
angle	the angle (in radian) between x and y.
angleDeg	the angle (in degrees) between x and y.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
  x <- c(1,2,2,-1)
y <- c(0,0.1,3,2)
  (l <- lengths.angle(x, y))  # == lengths.angle(cbind(x, y))
#> $lx    #> [1] 3.16228
#> $ly    #> [1] 3.60694
#> $angle #> [1] 1.1937
l$angle/pi*180 # in degrees  >  68.394
```

---

libs *List all installed packages, or all functions in a package*

Description

Lists all packages (called without an argument) or the functions in a package (called with the package name - quotes not needed).

Usage

```
libs(Lib)
```

Arguments

Lib	package name, if missing see above

Author(s)

??

Examples

```
libs()
libs(base)
```

lowess.bygroup *Plot data in groups, each group with separate lowess smoothing*

Description

data in groups (shown by variable group) are plotted

Usage

```
lowess.bygroup(x, y, group, span=2/3, col=seq(along=x), lty=seq(along=x))
```

Arguments

x, y	coordinate vectors of equal length
group	grouping variable, must be a vector of same length as x and y
span	span of smooting
col	colour of lines
lty	line type

Value

The procedure is called for its side effect of producing a plot

Author(s)

Christian W. Hoffmann, <c-w.hoffmann@sunrise.ch>

Examples

```
gr <- c(rep(1,20),rep(2,30),rep(3,50))
x <- seq(along=gr); y <- jitter(0.01*(x-50)^2 + 1,1000)
plot(x,y,pch=".",cex=4)
lowess.bygroup(x,y,gr,span=0.2,col=c("red","green","magenta"),lty=rep(2,3))
lowess.bygroup(x,y,gr,span=0.4,col="blue")
```

lpr *Print an object or plot*

Description

lprIf an object name is given, that object will be printed, otherwise the current plot will be printed. pdfc The current plot will be printed (assuming a Postscript printer)

Usage

```
lpr(object, file="Rplotlpr.ps", ...)
pdfc(file = "Rplot.pdf", ...)
```

Arguments

`object`	The object to be printed. If missing, the current plot will be printed.
`file`	A file name
`...`	Additional parameters for `dev.copy`.

Author(s)

Ray Brownrigg <ray@mcs.vuw.ac.nz>
modified by Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

`ls.functions` *List available functions*

Description

Returns a list of all the functions in the current work space.

Usage

```
ls.functions()
```

Author(s)

?

`mult.fig.p` *Plot Setup for multiple plot, incl. main title*

Description

Easy Setup for plotting multiple figures (in a rectangular layout) on one page. It allows to specify a main title, a bottom line, and uses *smart* defaults for several `par` calls.

Usage

```
mult.fig.p(nr.plots, mfrow, mfcol,
         marP = rep(0, 4),  mgp = c(1.5, 0.6, 0),
         mar = marP + 0.1 + c(4, 4, 2, 1),
         main = NULL, sub = NULL, adj.sub = 0.5,
         tit.wid = if (is.null(main)) 0 else 1 + 1.5*cex.main,
         quiet = .Device == "postscript",
         cex.main = par("cex.main"),
         col.main = par("col.main"),
         font.main = par("font.main"), ...)
```

Arguments

nr.plots	integer; the number of plot figures you'll want to draw.
mfrow	*instead* of nr.plots: integer(2) vector giving the rectangular figure layout for par(mfrow= .)
mfcol	*instead* of nr.plots: integer(2) vector giving the rectangular figure layout for par(mfcol= .)
marP	numeric(4) vector of figure margins to *add* ("**P**lus") to default mar, see below.
mgp	argument for par(mpg= .) with a smaller default than usual.
mar	argument for par(mar= .) with a smaller default than usual, using the marP argument, see above.
main	character. The main title to be used for the whole graphic.
sub	character. The bottom line to be used for the whole graphic.
adj.sub	The value of adj determines the way in which sub is justified. A value of 0 produces left-justified text, 0.5 centered text and 1 right-justified text. See par(adj= .)
tit.wid	numeric; the vertical width to be used for the main title.
quiet	Suppress request to restore graphical parameters.
cex.main	numeric; the character size to be used for the main title.
col.main	string; name of the color to be used for the main title.
font.main	numeric; number of the font to be used for the main title.
...	Further arguments to mtext for main and sub.

Value

A list with two components that are lists themselves, a subset of par(),

new.par	the current par settings.
old.par	the par *before* the call.

Author(s)

Martin Maechler, <maechler@stat.math.ethz.ch>,
modified by Christian W. Hoffmann, <c-w.hoffmann@sunrise.ch>

See Also

par, layout.

Examples

```
AA <- mult.fig.p(5, main= "Sine functions of different frequencies")
x <- seq(0, 1, len = 201)
for (n in 1:5)
  plot(x, sin(n * pi * x), ylab ="", main = paste("n = ",n))
par(AA$old.par)

rr <- mult.fig.p(mfrow=c(4,2), main= "Sine functions", cex = 1.5,
               marP = - c(0, 1, 2, 0))
for (n in 1:8)
  plot(x, sin(n * pi * x), type = 'l', col="red", ylab ="")
str(rr)
par(rr$old.par)
## Look at the par setting *AFTER* the above:
str(do.call("par", as.list(names(rr$new.par))))
```

---

my.table *Tabulate data, with extra rows and columns.*

Description

my.table.NA tabulates a vector of values and lists NA and NaN at the beginning, if they occur. my.table.margin generates contingency table together with both margins of two factors, or of a matrix, if only one parameter is given.

Usage

```
my.table.NA(x, relative=FALSE)
my.table.margin(v,w)
```

Arguments

x	A vector, will be converted to factors.
relative	= TRUE if relative values should be returned.
v	factor or matrix.
w	factor.

Value

A contingency table.

Note

Uses table.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>
and John Fox <jfox@mcmaster.ca> (my.table.margin)

Examples

```
x <- c(1,NA,2,5,-1:7)
my.table.NA(x)
f1 <- sample(1:5,100,replace=TRUE)
f2 <- sample(1:5,100,replace=TRUE)
my.table.margin(f1,f2)
my.table.margin(matrix(1:24,4))
```

---

n22dig *Show vector or matrix (of 0 <= x <=10) in a compact way*

Description

n22dig shows as two characters: "0.ab" as "ab", "1.00" as " I", "0" as " 0".

Usage

```
n22dig(x, symm = TRUE)
```

Arguments

x	A numerical vector or matrix with elements <= 1.
symm	If symm = TRUE then upper triangle will be shown as " ".

Value

Representation of x as two-digit vector or matrix.

Note

A violation of the condition on abs(x) will not be signalled. Empty places due to symm = TRUE are filled with " ".

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

See Also

n2c.

Examples

```
n22dig(cor(matrix(rnorm(100),10)),TRUE)
#       [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10]
#  [1,] " I" " "  " "  " "  " "  " "  " "  " "  " "  " "
#  [2,] "10" " I" " "  " "  " "  " "  " "  " "  " "  " "
#  [3,] " 8" "26" " I" " "  " "  " "  " "  " "  " "  " "
#  [4,] " 8" "49" " 2" " I" " "  " "  " "  " "  " "  " "
#  [5,] " 8" "22" " 9" "46" " I" " "  " "  " "  " "  " "
#  [6,] "40" "26" " 5" "27" "14" " I" " "  " "  " "  " "
#  [7,] " 8" "15" "21" "58" "13" "26" " I" " "  " "  " "
#  [8,] "13" "30" " 2" "58" "21" "41" "61" " I" " "  " "
#  [9,] "46" "22" " 7" "63" "15" "25" "43" "36" " I" " "
# [10,] "66" "51" "48" "16" "20" "27" "28" "20" "16" " I"
```

---

n2c *Show absolute values as characters, prepare for plotting*

Description

n2c takes a numerical vector or matrix and represents it as single characters, with attribute legend. indexLine generates a string with dots, ";", and digits, usable as x-label in n2cCompact: .....;....1....;....2.. n2cCompact combines n2c and indexLine to generate a vector of strings good for printing numerical matrices. charMat processes the output from n2cCompact and returns vectors x, y, tx of equal lengths for input to pltCharMat. explainLegend gives a more readable version of attribute legend.

Usage

```
n2c(x, symm = FALSE)
indexLine(n)
n2cCompact(x, symm=FALSE)
charMat(cc)
explainLegend()
```

Arguments

x	A numerical vector or matrix.
symm	If symm = TRUE then upper triangle will be suppressed.
n	integer, length of string wanted
cc	output from n2cCompact, input to charMat

Value

n2c Representation of x as a single-character matrix, as explained in *attribute* legend. n2cCompact pack charMat list(x,y,txt)

Note

Empty places due to symm = TRUE are filled with " ".

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
n2c(c(10e20,-10e5,10,(10:0)/10,0.05))
#   "X" "6" "1" "0" "&" "%" "#" "*" "=" "+" "-" ":" "," " "
# attr(,"legend")
# [1] ">=1:log, >=0. 9& 8% 7# 6* 5= 4+ 3- 2: 1, 05. ' ' "

n2c(matrix(c(10e20,10e5,20,10,0.7,0.6,0,0.5,0.1),3,3),FALSE)
#      [,1] [,2] [,3]
# [1,] "X"  "1"  " "
# [2,] "5"  "#"  "="
# [3,] "1"  "*"  ","
# attr(,"legend")
# [1] ">=1: log, >=0. 9& 8% 7# 6* 5= 4+ 3- 2: 1, 05. ' ' "
m <- matrix(rnorm(500),nrow=50,ncol=10)
n2c(m,symm=TRUE)
indexLine(ncol(m))
(n2 <- n2cCompact(m, symm=FALSE))
charMat(n2)
explainLegend() #
```

`num.ident` *Check numerical values for identity*

Description

Check two variables on numerical identity or whether both are either NaN or NA.

Usage

```
num.ident(x,y)
```

Arguments

`x, y`	Variables to check for identity, may be arrays.

Value

`TRUE`, `FALSE`

Note

No check is made whether `x` or `y` are numeric

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
xxxx <- c(100,-1e-13,Inf,-Inf, NaN, pi, NA)
names(xxxx) <- formatC(xxxx, dig=3)
(aaaa <- outer(xxxx,xxxx,function(x,y) num.ident(x,y)))
all((aaaa & !is.na(aaaa)) == (row(aaaa) == col(aaaa)))
# aaaa has TRUE only on the diagonal, i.e. identity works correctly
```

---

num2Latex *Convert numeric containing e+-power*

Description

Latex string with power notation

Usage

```
num2Latex(x, digits = 0)
```

Arguments

x	numerical vector
digits	digits to show, see also options scipen

Value

Vector of strings representing the given numbers, xe-y -> $x . 10 ^-y$

Author(s)

<dimitris.rizopoulos@med.kuleuven.be>

Examples

```
z <- c(1.5, 5e-12, 2.33e-03, 8.12e+10, 2)
num2Latex(z)     #  1.5,  5 \cdot 10^{-12},  0.00233,  8.12 \cdot 10^{10},  2
num2Latex(z, 2)  #  1.5,  5 \cdot 10^{-12},  2.33 \cdot 10^{-3},  8.12 \cdot 10^{10},  2
num2Latex(z, -3) #  1.5,  5 \cdot 10^{-12},  0.00233, 81200000000, 2
```

numberof *Count the number elements that satisfy a condition.*

Description

numberof counts the number elements that satisfy a condition.

Usage

```
numberof(x, f)
```

Arguments

x	Numerical array.
f	Logical function emulating the condition to be satisfied.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
numberof(c(1:100,NA,NA,NaN),function(x) !is.na(x))
```

numeric *Number theoretic functions*

Description

Simple number theoretic functions

Usage

```
scm( m, n )
EulerPhi( n )
gcd( m, n )
EuclidExtended( m, n )
modexp( a, b, n )
```

Arguments

a,b,m,n	Integer

Details

`EulerPhi` Eulers totient function = #divisors of n. `scm, gcd` Smallest common multiple, Greatest common divisor. `EuclidExtended` Computes a, b which solve the equation a*m + b*n = gcd(m,n). `modexp` Exponentiation modulo an integer.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
scm(35,133) # 665
gcd(35,133) # 7
EuclidExtended(35,133) #   4 -1, meaning 4*35 -1*133 = 7
EulerPhi(60) # 16
modexp(3,10,7)  # 4
```

`padding` *Padding a string with justification*

Description

`padding` Pads a string.

Usage

```
padding(str, space, with, to=c("left","right","center"))
```

Arguments

`str`	String to be padded.
`space`	Resulting length of padded string.
`with`	String to pad with. Will be repeated as often as necessary.
`to`	Mode of padding, one of "left","right","center".

Value

A string

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
padding("My string",25,"XoX","center")
 # [1] "XoXXoXXoMy stringXXoXXoXX"
```

panel *Alternative panel functions for lattice plots*

Description

Functions which can be used instead of the default functions in panel plots.

Usage

```
panel.hist(x, ...)
panel.cor(x, y, digits=2, prefix="", cex.cor)
```

Arguments

x, y	variables defining the contents of the panel.
digits	Number of decimals after dot with which correlations will be printed.
prefix	Prefix text for numbers.
cex.cor	Determines height of printed digits, may be missing.
...	graphical parameters can be supplied. see function definition for details.

Author(s)

?? <>

Examples

```
n <- 1000; a <- rnorm(n,mean=1)
x <- matrix(c(a,a+2*log(runif(n)),a^2+0.2*rnorm(n,mean=1)),nrow = n)
pairs(x,lower.panel=panel.smooth, diag.panel=panel.hist,
upper.panel=panel.cor, labels = c("rnorm","rnorm+log(runif)","rnorm^2"))
```

pasteInfix *Paste(infix)*

Description

Paste as infix

Usage

```
a %&% b
```

Arguments

a	an R object, to be coerced to character vectors.
b	an R object, to be coerced to character vectors.

Value

The concatenation of a and b, same as `paste(a, b, sep="")`

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

See Also

String manipulation with `paste`, `as.character`, `substr`, `nchar`, `strsplit`; further, `cat` which concatenates and writes to a file, and `sprintf` for C like string construction.

Examples

```
"I am" %&% " hungry" # [1] "I am hungry"
```

---

pasteRound *Paste rounded values*

Description

Paste rounded values

Usage

```
pasteRound(..., digits=16, sep=" ", collapse=NULL)
```

Arguments

`...`	list of arguments to be pasted.
`digits`	Integer, argument to `round`.
`sep, collapse`	Character, arguments to `paste`.

Value

The concatenation of formatted values

Author(s)

Dimitris Rizopoulos <dimitris.rizopoulos@med.kuleuven.ac.be>, adapted by Christian Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
x <- rnorm(3)
x
matrix(pasteRound("x1=", x[1], ", x2=", x[2], ", x3=", x[3], sep="",
 collapse=","),ncol=1)
matrix(pasteRound("x1=", x[1], ", x2=", x[2], ", x3=", x[3], digits=3,
 sep="$", collapse="_"),ncol=1)
```

`plotSymbols` *Plot symbols, colours, and allow to choose*

Description

A plot of symbols is generated. By clicking the mouse on a symbol the numeric codes are given in ASCII, octal, hex. Plot symbols depending on font.

Usage

```
plotSymbols(interactive=FALSE)
availColors(indx = 0:6)
plotSymbolsFonts(fn=1)
```

Arguments

`interactive`	allow choice of symbols
`indx`	indices of panels showing 100 colours each
`fn`	a font number 1 . . . 5

Value

list of

`ch`	character value of symbol
`dec`	decimal value of symbol
`hex`	hex value of symbol
`oct`	octal value of symbol

Note

To turn off the click-bell do 'options(locatorBell=FALSE)' (see ?locator).

Author(s)

Henrik Bengtsson <hb@maths.lth.se>, adapted by Christian W. Hoffmann, <c-w.hoffmann@sunrise.ch>

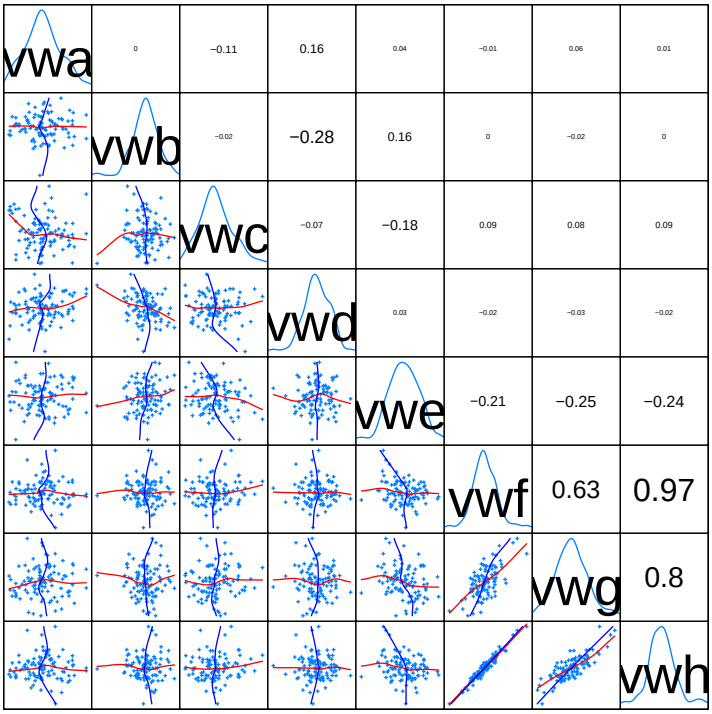
Examples

```
# A first impression:
n<-1:34; plot(n,pch=n) # There is a gap between 25 and 34
plotSymbols(TRUE)
```

`plt` *Plot depending on switch, Create multiple plots with title and time stamp*

Description

- `pltCharMat` uses output from `charMat` to plot numerical matrices as characters. - `pltRCT` executes a (series of) plotting function(s) under the control of some useful switches, may be useful in `source`. - `histRCT` creates a (series of) histogram(s), uses `pltRCT`. - `SplomT` creates a scatterplot matrix with a) covariances (with script size proportional to size) in the upper triangle, b) histograms (with smoothing) and variable names in the diagonal, and c) scatterplot with smoothes in y and x direction in the lower triangle, stressing high correlations by nearly parallel



lines.

Usage

```
pltCharMat(m,...)
pltRCT(rows, cols, tit="", f = function(x) 0, cex = 1.5,
```

```
    reset = TRUE, outer = TRUE, oma = c(2, 2, 4, 2), mar = c(4, 4, 2, 1))
histRCT(data, rows = round(sqrt(ncol(data))),
    cols = ceiling(ncol(data)/rows), breaks = "Sturges",
     mainL = deparse(substitute(data)), mainC = colnames(eval(substitute(data))))
SplomT(data, mainL = deparse(substitute(data)), xlabL = "",
   hist = "h", adjust = 1, hist.col = trellis.par.get("strip.background")$col[5],
      cex.diag = 1, h.diag=0.4, colYonX = "red", colXonY = "blue", ...)
```

Arguments

`m`	Numerical matrix
`tit`	Overall title for plot. A vector of one or two elements. If an element is an `expression`, `plotmath` will be used.
`rows`	Number of rows of panels
`cols`	Number of columns of panels
`f`	A function to plot the individual plot panels. It can also be a statement sequence {...}.
`cex`	Font size used for `tit`
`reset`	Should previous `rows, cols` be restored after execution. See `note`
`outer`	Passed on to mtext.
`oma`	Outer margin used in initial par(...).
`mar`	Lines of margin used in initial par(...).
`data`	Matrix or dataframe containing data, varibles in columns
`breaks`	Breaks for histogram
`mainL`	Label on top of scatterplot matrix or matrix of histograms
`mainC`	Labels on top of each of the histograms, should be character vector of length = number of columns of data
`xlabL`	Label for x axis
`hist`	"h" = histogram, "d" = density curve, "b" = both
`adjust`	factor to adjust smoothing window for density curve
`hist.col`	colour for the bars of the histograms
`cex.diag`	correction factor for font height of correlations and names in the diagonal
`h.diag`	placement of the variable name in the diagonal panel, =0 means on the lower border, = 0.5 in the middle between lower and upper border
`colYonX, colXonY`	colour of smoothing lines, y on x and x on y
`...`	Parameters passed on to upper.panel,lower.panel,diag.panel

Value

These functions are called for their side effect to produce a plot.

WARNING

The sequence of functions contained in f MUST NOT contain any call to postscript, because this would try to open another ps device without closing the old one!

Note

oldpar <- par(mfrow = c(rows, cols),oma=oma,mar=mar) is called at the beginning of pltRCT. Uses splom, [lattice:extend.limits]extend.limits, and datetime .

If you have n panels you want to plot in a nearly quadratic arrangement, use rows = round(sqrt(n)), cols=ceiling(n/rows) (tending to slightly "landscape"). This is very similar to n2mfrow. histRCT drops columns with less than 2 legal (non-NA) values. For empty matrices no plot will be generated.

Author(s)

Christian W. Hoffmann, <c-w.hoffmann@sunrise.ch>, with the assistance of Deepayan Sarkar <Deepayan.Sarkar@r-project.org>.

Examples

```
x <- rnorm(100); y <- rnorm(100)+1; z <- y+rlnorm(100)
pltRCT(2,1,f={plot(x,y,xlab="this is my x");
  abline(reg=lm(y~x),lty=2);points(x,z,pch=3)})
nr <- 100; nc <- 8;
data <- as.data.frame(matrix(rnorm(nr*nc),nrow=nr,ncol=nc))
data[,nc]   <- data[,nc-2] + 0.3*data[,nc-1] #generate higher correlations
data[,nc-1] <- data[,nc-1] + 0.9*data[,nc]
colnames(data)<-paste("vw",letters[1:nc],sep="")
SplomT(data,mainL="",hist="d",cex.diag=0.6,hist.col="green")
SplomT(data,mainL="",hist="b",adjust=0.4,cex.diag = 0.5)
pltRCT(1, 1, tit="1 by 2 plot", f=plot(y,x-3*y) )
pltRCT(1, 2, f={plot(x,y,xlab="my x");
  m <- matrix(rnorm(500),nrow=50,ncol=10)
  pltCharMat(m,"Random example",xlab="rnorm(500)")
})
```

---

pointfit *Least squares fit of point clouds, or the Procrustes problem.*

Description

Find a transformation which consists of a translation tr and a rotation Q multiplied by a positive scalar f which maps a set of points x into the set of points $xi : xi = f * Q * x + tr + error$. The resulting error is minimized by least squares.

Usage

```
pointfit(xi,x)
```

Arguments

x	Matrix of points to be mapped. Each row corresponds to one point.
xi	Matrix of target points. Each row corresponds to one point.

Details

The optimisation is least squares for the problem $xi : xi = f * Q * x + tr$. The expansion factor f is computed as the geometric mean of the quotients of corresponding coordinate pairs. See the program code.

Value

A list containing the following components:

Q	The rotation.
f	The expansion factor.
tr	The translation vector.
res	The residuals xi - f * Q * x + tr.

Author(s)

Walter Gander, <gander@inf.ethz.ch>,
http://www.inf.ethz.ch/personal/gander/ adapted by Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

References

"Least squares fit of point clouds" in: W. Gander and J. Hrebicek, ed., Solving Problems in Scientific Computing using Maple and Matlab, Springer Berlin Heidelberg New York, 1993, third edition 1997.

See Also

rotL to generate rotation matrice

Examples

```
  # nodes of a pyramid
  A <- matrix(c(1,0,0,0,2,0,0,0,3,0,0,0),4,3,byrow=TRUE)
  nr <- nrow(A)
  v <- c(1,2,3,4,1,3,4,2)  # edges to be plotted
#  plot
  # points on the pyramid
  x <-
matrix(c(0,0,0,0.5,0,1.5,0.5,1,0,0,1.5,0.75,0,0.5,
2.25,0,0,2,1,0,0),
    7,3,byrow=TRUE)
  # simulate measured points
  # theta <- runif(3)
  theta <- c(pi/4, pi/15, -pi/6)
```

```
  # orthogonal rotations to construct Qr
  Qr <- rotL(theta[3]) %*% rotL(theta[2],1,3) %*% rotL(theta[1],2,3)
  # translation vector
  # tr <- runif(3)*3
  tr <- c(1,3,2)
  # compute the transformed pyramid
  fr <- 1.3
  B <- fr * A %*% Qr + outer(rep(1,nr),tr)
  # distorted points
  # xi <- fr * x + outer(rep(1,nr),tr) + rnorm(length(x))/10
  xi <- matrix(c(0.8314,3.0358,1.9328,0.9821,4.5232,2.8703,1.0211,3.8075,1.0573,
0.1425,4.4826,1.5803,0.2572,5.0120,3.1471,0.5229,4.5364,3.5394,1.7713,
3.3987,1.9054),7,3,byrow=TRUE)
  (pf <- pointfit(xi,x))
  # the fitted pyramid
  (C <- A %*% pf$Q + outer(rep(1,nrow(A)),pf$tr))  ## !!!!!!  %*% instead of %*%
  # as a final check we generate the orthogonal matrix S from the computed angles
  # theta and compare it with the result pf$Q
  Ss <- rotL(theta[3])
  range(svd(Ss*pf$factor-pf$Q)$d) #  6.652662e-17 1.345509e-01
```

`printP` *Print without square brackets, expression values together with their call strings*

Description

These functions may be helpful for documenting ongoing work using `sink()`.
- `catn(...)` is shorthand for cat(...); cat("\n")
- `pn()` is shorthand for cat("\n") which is awkward for me to type.
- `prinV` prints a vector without \[\], in fix format.
- `prinM` prints a matrix without \[\], in fix format.
- `prinT` prints an array, TAB delimited.
- `prinE(xsv, ...)` prints a string expression and its evaluation in the form "xsv = evaluation", in vector form. The string may contain "'commenting text'; expression(s)", but only the last expression will be evaluated.
- `prinL(xs, ...)` prints a string expression and its evaluation in the form "xs" newline evaluation".
- `prinP(xs)` prints a string argument and evaluates it i.e. the body of the function evaluated should contain print and cat statements.
– The variants N... prepend a linefeed.

Usage

```
catn(...)
pn()
prinV(x,after=2,before)
prinM(x,after=2,before)
```

```
prinT(x,rownam=FALSE,colnam=FALSE)
prinE(xsv,...)
prinL(xs,...)
prinP(xs)
```

Arguments

x	A numerical vector or matrix.
before	See formatFix, the number of decimals before "."
after	See formatFix, the number of decimals after ".".
rownam	Should row names be printed.
colnam	Should column names be printed.
xsv	A string representing a vector expression.
xs	A string representing an expression.
...	Additional parameters for print.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
xx <- options(digits=7)
x <- matrix(c(5,3,2,7,8.235,exp(1),pi,0,99),3,3)
m <- matrix(c("a","b c","d","ff"," x","","7","8","99"),3,3)
dimnames(x) <- list(c("r1","r2","r3"),c("c1","c2","c3"))


prinV(as.vector(x))
#  5.00  3.00  2.00  7.00  8.24  2.72  3.14  0.00 99.00

prinM(x,,3)
#  5.00  7.00  3.14
#  3.00  8.24  0.00
#  2.00  2.72 99.00

prinT(x,TRUE,TRUE)
#    c1 c2 c3
# r1 5 7 3.14159265358979
# r2 3 8.235 0
# r3 2 2.71828182845905 99

prinT(c(c1="a",c2="b c",c3="d",c4="ff",c5=" x"),TRUE)
# c1 c2 c3 c4 c5
# a b c d ff  x      # the tabs are not visible here

prinT(c(c1=5,c2=7,c3=1,c4=3),TRUE)
# 5 7 1 3      # the tabs are not visible here
```

```
####prinE("x")
# x =[1]  5.000000  3.000000  2.000000  7.000000  8.235000  2.718282  3.141593
# [8]  0.000000 99.000000

####prinE("'This is a comment: ';3+5;pi-3",digits=4)
# 'This is a comment: ';3+5;pi-3 =[1] 0.1416
prinL("x")
# x
#    c1       c2        c3
# r1  5 7.000000  3.141593
# r2  3 8.235000  0.000000
# r3  2 2.718282 99.000000

catt <- function(x) {cat("This function will write '",x,"' on one line\n") }
y <- prinP("catt(32)");
# catt(32)
# This function will write ' 32 ' on one line

####prinE("y ")
# y =[1] "catt(32)"

prinL("y ")
# y
# [1] "catt(32)"

prinP("y ")
# y

options(digits=xx$digits)
```

`progress.meter` *Monitor the progress of a repetitive calculation.*

Description

`progress.meter` writes a symbol to the output at each invocation. The symbol is usually a ".", a "+" if i %% == 0, and (i %\/% 10) %% 10 if i %% 10 == 0. If i %% 50 == 0, a line break will be written and i printed.

Usage

```
progress.meter(i) # inside a function or loop
```

Arguments

i	Integer.

Value

invisible(NULL).

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
  n <- 1 # adjust
  for (i in 0:250) {
    kk <- 0
    for (mm in 1:10^n) {
      kk <- kk+1  # do something time consuming
    }
    progress.meter(i)
  }
  cat("")
#    0....+....1....+....2....+....3....+....4....+....
#   50....+....6....+....7....+....8....+....9....+....
```

---

qnorm.appr *Approximation to the inverse normal distribution function.*

Description

qnorm.ap* approximate the normal quantile function. They compute x such that P(x) = Prob(X <= x) = p.

Usage

```
  qnorm.app3(p, mean = 0, sd = 1, lower.tail = TRUE, log.p = FALSE)
  qnorm.app4(p, mean = 0, sd = 1, lower.tail = TRUE, log.p = FALSE)
  qnorm.ap16(p, mean = 0, sd = 1, lower.tail = TRUE, log.p = FALSE)
```

Arguments

p	vector of probabilities.
mean	vector of means.
sd	vector of standard deviations.
log.p	logical; if TRUE, probabilities p are given as log(p).
lower.tail	logical; if TRUE (default), probabilities are P(X <= x), otherwise, P(X > x).

Value

qnorm.ap* gives the quantile function for the different approximations.

Warning

If `p <= 0` or `p >= 1`, then NA will be returned.

If p is very close to 1, a serious loss of significance may be incurred in forming `c := 1 - p`, resulting in `p = 0`. In this case c should be derived, if possible, directly (i.e. not by subtracting p from 1) and evaluate `qnorm(p,...,lower.tail=B)` as `qnorm(c,...,lower.tail = (B==FALSE))`.

Note

`qnorm.ap16` is the approximation used in qnorm. The others have an absolute error < 10^{-3} and 10^{-4}.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Source

`qnorm.app3` and `qnorm.app4`: Abramowitz and Segun, Dover, 1968, formulae 26.2.22 and 26.2.23,

`qnorm.ap16`: Wichura, M. J., 1988. Algorithm AS 241: The Percentage Points of the Normal Distribution. Applied Statistics 37, 477-484.

Examples

```
  prec <- function(x,y,z=y) max(abs((x-y)/z)) # relative precision
  x2 <- -0.6744897501960817; p2 <- 0.25
  x0 <- -3.090232306167814;  p0 <- 0.001
  xm <- -9.262340089798408;  pm <- 1.0e-20
  x  <- c((-100:0)/10,x2,x0,xm)
  p  <- pnorm(x)
  x3 <- qnorm.app3(p)
  x4 <- qnorm.app4(p)
  x1 <- qnorm.ap16(p)
# Check relative precision of approximations
  prec(x,x3,1)  # 0.002817442
  prec(x,x4,1)  # 0.0004435874
  prec(x,x1,1)  # 0.1571311 why so bad ?
  prec(x,qnorm(p),1)  # 1.776357e-15
# Special values
  prec(qnorm.app3(p2),x2)  # 0.004089976
  prec(qnorm.app3(p0),x0)  # 0.0007736497
  prec(qnorm.app3(pm),xm)  # 7.29796e-06
  prec(qnorm.app4(p2),x2)  # 0.0004456853
  prec(qnorm.app4(p0),x0)  # 9.381806e-05
  prec(qnorm.app4(pm),xm)  # 4.151165e-05
  prec(qnorm.ap16(p2),x2)  # 0
  prec(qnorm.ap16(p0),x0)  # 2.874148e-16
  prec(qnorm.ap16(pm),xm)  # 0.01211545
```

RCA *Check, build, install package.*

Description

RC: Use with type = ("c"), "b", "c", "a", "i", in that order.
RCA: Execute RC with any of 0:5, typically 2:5. Check for errors and repeat. Package treated is located in directory paste(dir,"/",pkg,sep="")

Usage

```
RC(dir,pkg,type="c")
RCA(dir,pkg,trig=c(0,2:5))
```

Arguments

dir	character, path of (collection of) package(s)
pkg	character, name of package
type	"a", "b", "c","i" for 'check –as-cran', 'build', 'check','install'
trig	integer, any subset of 1:5 corresponding to "c", "b", "c", "a", "i" in RC, 0 for an explanatory text concerning "c"

Note

"RC" calls system("R CMD <options> path-to-package ") with options "check –as-cran","build","check","install" corresponding to "a","b","c","i", triggered by "trig" 4, 2, 1 and 3, 5, respectively. The order 1 to 5 is suggested by 'Writing extensions'. For trig = 0 a message is printed: For checking as required by CRAN policy, run RC() with pkg='pkg_VERSION.tar.gz'.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
## Not run:
  RC("/User/.../R/sources","pack","c")  # treating "/User/.../R/sources/pack"
  RCA("...", 2:4) # corresponding to RC(...,"b"); RC(...,"c"); RC(...,"i")

## End(Not run)
```

remove.dup.rows *Remove duplicate rows*

Description

Removes duplicate rows from a dataframe.

Usage

```
remove.dup.rows(dfr)
```

Arguments

dfr	A dataframe

Details

Uses the function eql.

Value

The dataframe with only one copy of identical rows.

Author(s)

Peter Dalgaard, <p.dalgaard@biostat.ku.dk>

Examples

```
dfr <- data.frame(matrix(c(1:3,2:4,1:3,1:3,2:4,3:5),6,byrow=TRUE))
remove.dup.rows(dfr)
```

replacechar *Replace a character in a string by another*

Description

replacechar replaces a character in a string by another

Usage

```
replacechar(str, char = "_", newchar = ".")
```

Arguments

str	The string to be altered.
char	The character to be replaced.
newchar	The character to replace with.

Value

The altered string.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch> adapted from tjoelker@redwood.rt.cs.boeing.com (Rod Tjoelker 865-3197)

Examples

```
replacechar("my_queer_file,name") # "my.queer.file,name"
replacechar("my_queer_file,name","m","M") # "My.queer.file,naMe"
```

---

rotL *Rotation matrix*

Description

Generate a square orthogonal rotation matrix for pre-multiplication.

Usage

```
rotL(phi,k=1,m=2,n=3)
rotPz(P)
```

Arguments

n	Order of the square rotation matrix >= 2.
k,m	Integers describing the plane of rotation, i.e. 1,2,3=x,y,z
phi	Real, angle of counter clockwise rotation in radian.
P	c(x,y,z), coordinates of projection point or projection direction P-Origin

Value

rotL: Matrix m for multiplication m%*%vector.
rotPz: rotation matrix for $(0, 0, zz)' = r * (x, y, z)'$.
rotaP: rotation matrix around axis (P - Orig, Orig = c(0,0,0)).

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
  par(mfrow=c(2,4))
  x<- -20:20;Data <- matrix(c(x^2*10,(x^2-10*x)*4,(x+10)*1.5),ncol=3)
##  Data <- matrix(c(rnorm(99)*10,rnorm(99)*4,rnorm(99)*1.5),ncol=3)
  lim <- range(c(Data,-Data))*1.5
  RD <- Data
  RD2 <- RD
  RD3 <- RD2
  plot(Data[,-3],xlim=lim,ylim=lim,xlab="x",ylab="y",pty="s")
  plot(RD[,-3],xlim=lim,ylim=lim,xlab="RD x",ylab="y",pty="s",pch=5,col="red")
  plot(RD2[,-3],xlim=lim,ylim=lim,xlab="RD2 x",ylab="y",pch=6,col="blue")
  plot(RD3[,-3],xlim=lim,ylim=lim,xlab="RD3 x",ylab="RD3 y",col="magenta")
  plot(Data[,1],RD3[,1])
  plot(Data[,2],RD3[,2])
  plot(Data[,3],RD3[,3])
  m <- rotL(pi/6,1,2)
  m
  eye <- c(0.5,2.5,4)
  re  <- rotPz(eye)
  round(rotaP(c(1,1,1),pi/1.5),2)
# [1,]    0    1    0  Permutation of axes 1 -> 2 -> 3 -> 1
# [2,]    0    0    1
# [3,]    1    0    0
```

---

scode *Generate the significance codes as in summary.lm*

Description

Generate the significance codes as in summary.lm

Usage

```
scode(p)
```

Arguments

p	Probability

Value

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Note

lifted from stats::printCoefmat

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
for (ii in c(0.005, 0.02,0.0501,0.2)) { print(scode(ii)) }
```

`select.range` *Select values from a vector depending on a range in a second vector.*

Description

`select.range` accepts two vectors of paired observations and returns a vector of observations from `data`. The observations returned are those for which the paired values in `groupvec` are within the range specified by `min` and `max`. NOTE: The in-range condition is *greater than or equal to* `min` and *less than* `max`. This allows contiguous ranges to be specified without returning the same value in two sets.

Usage

```
select.range(data, groupvec, min, max)
```

Arguments

`groupvec`	A vector of observations to be used for grouping.
`min`	The minimum value of the range.
`max`	The maximum value of the range.
`data`	A numeric vector of observations.

Value

The subset of observations from `data` is returned invisibly.

Author(s)

??

Examples

```
testvec <- c(2.1,4.3,3.2,5.1,4.2,5.7,7.1,6.5,4.1,5,6,8,7,9 ,8 ,NA,NA)
agevec  <- c(10 ,13 ,14 ,25 ,29 ,32 , 34, 45, 48, 55, 62,67,69,70,74)
select.range(testvec,agevec,25,34.5) #  5.1 4.2 5.7 7.1
```

seqm *sequences, empty if "by" not conforming*

Description

Generate sequences, but unlike "seq", return NULL, when "seq" would generate a backward sequence. This function is useful for `for`-loops, when empty loops are required, if by is in the "wrong" direction, see *examples*.

Usage

```
seqm(from, to, by=1)
```

Arguments

`from`	starting value of sequence.
`to`	(maximal) end value of the sequence.
`by`	increment of the sequence.

Value

`NULL`, if (to-from)*by <0, otherwise usual result of `seq` i.e. seq.default.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
seqm(12,4,-1)  #  12 11 10  9  8  7  6  5  4
seqm(12,4,2)   #  NULL
lo <- 1; up <- 3
for (ii in lo:up) {
  cat(ii,"    ")
  for (kk in seqm(lo,ii-1)) {
    cat("   ",kk)  # do-in-lower-triangle
  }
  cat(" diag")     # do-something-on-the-diagonal
  for (kk in seqm(ii+1,up)) {
    cat("  :",kk)  # do-in-upper-traingle
  }
  cat("\n")
}
# 1      diag  : 2  : 3
# 2         1 diag  : 3
# 3         1    2 diag
```

setPPT *Set PowerPoint style*

Description

Set par() with suitable options for Power point slides. Note that you have to set them every time you open up a new device. Then save the pictures to PNG format with 'width=5' and 'height=5' pointsize='14'.

Usage

```
setPPT()
```

Author(s)

Henrik Bengtsson, <hb@maths.lth.se>

shapiro.wilk.test *Shapiro-Wilk Normality Test*

Description

Performs the Shapiro-Wilk test for normality.

Usage

```
shapiro.wilk.test(x)
```

Arguments

x	a numeric vector of data values, the number of which must be between 3 and 5000. Missing values are allowed.

Value

A list containing the following components:

W	the value of the Shapiro-Wilk statistic.
n	length(x)
p	the p-value for the test.

Author(s)

??

See Also

shapiro.test

Examples

```
shapiro.wilk.test(rnorm(100, mean = 5, sd = 3))  # $p 0.169547
shapiro.wilk.test(runif(100, min = 2, max = 4))  # $p 6.09393e-06
```

---

signp *Sign Function*

Description

sign returns a vector with the signs of the corresponding elements of x: ifelse(x >= 0, 1, -1) .

Note that sign does not operate on complex vectors.

Usage

```
signp(x)
```

Arguments

x	a numeric vector

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

See Also

sign

Examples

```
signp(-2:3)# -1 -1 1 1 1 1
(m <- matrix(rnorm(9),3,3))
m %*% diag(signp(diag(m)))
```

`smoothed.df` *Fit cumulative distribution from kernel estimate.*

Description

Given a kernel density estimate, this function carries out a (very quick and dirty) numerical integration, and then fits a spline to get a function which can be used to look up cumulative probabilities.

Usage

```
smoothed.df(d)
```

Arguments

`d`	kernel density estimate

Value

The spline function approximating the df.

Author(s)

Ross Ihaka, <ihaka@stat.auckland.ac.nz>

Examples

```
x <- rnorm(1000) + ifelse(runif(1000) > .5, -3, 3)
d <- density(x)
F <- smoothed.df(d)   # F returns cumulative probs

# Plot the true (red) and estimated (blue) density functions
par(mfrow=c(1,2))
curve(0.5 * dnorm(x, -3) + 0.5 * dnorm(x, 3), -7, 7, col="red")
lines(d, col="blue")

# Plot the true (red) and estimated (blue) distribution functions
curve(0.5 * pnorm(x, -3) + 0.5 * pnorm(x, 3), -7, 7, col="red")
curve(F(x), add=TRUE, col="blue")
```

summaryFs *Print extended summary of lm.*

Description

Print summary of lm, std.dev and Finney's correction to log normally distributed data.

Usage

```
summaryFs(lm)
```

Arguments

lm	Result of an lm(log(y) ~ .)

Note

Uses FC.lm and s.lm

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
x <- rnorm(1000); y <- 0.1*rnorm(1000)
summaryFs(lm(y ~ x))
```

T3plot *T3plot*

Description

T3 plot for a graphical check on normality together with 95%- and 99%-acceptance regions. If the black line does not cross either the 5% nor the 1% line, the input data are normal with less than 1% error.

Usage

```
T3plot(x,lab=paste("T3 plot of ",deparse(substitute(x))),
legend.pos="bottom", cex=0.6, ...)
```

Arguments

x	Data vector.
lab	String for heading of plot.
legend.pos, cex, ...	see legend.

Value

Is called for its side effect to produce a T3 plot.

Author(s)

Sucharita Ghosh, <rita.ghosh@wsl.ch>,
http://www.wsl.ch/personal_homepages/ghosh/index_EN?redir=1&,
with cosmetics by Christian W. Hoffmann, <c-w.hoffmann@sunrise.ch>

References

Ghosh, S. (1996) A new graphical tool to detect non-normality. Journal of the Royal Statistical Society B , 58, 691-702.

Examples

```
par(mfrow=c(2,2))
T3plot(rnorm(100))
T3plot(rnorm(10000))
T3plot(rnorm(1000)+runif(1000)*0.1,"Example 3")
T3plot(rnorm(1000)+runif(1000)*10,"Example 4")
```

---

tex.table *Convert a data matrix into LaTeX code.*

Description

These functions convert a data matrix into LaTeX.

Usage

```
tex.table(dm, bare = FALSE, prec = if (bare) "NA" else 2,
 rnames = if (bare) "-1" else dimnames(dm)[[1]], cnames = if (bare)
 "-1" else dimnames(dm)[[2]], caption = NULL, label = NULL,
 tpos = "b", stretch = NULL, adjust = "r", file = NULL)
tex.tab0(dm, prec = 2, rnames = NULL, cnames = NULL,
  caption = NULL, label = NULL, tpos = "b", stretch = NULL,
  adjust = "r", file = NULL)
```

Arguments

dm	data matrix
bare	TRUE: prec,rnames,cnames will get useful defaults, FALSE: set these parameters yourself
prec	precision of rounding within the LATEX table, if NA, then no transformation to numeric is done
rnames	row names
cnames	column names
caption	caption for LATEX table, default: no caption
label	LATEX label for the table, default: no lable
tpos	position of captions: "a" for above table, "b" for belowbelow table
stretch	optional vector with two entries, giving the baselinestretch for the caption (stretch[1]) and the colums of the table (stretch[2]); default: no adjustment of baselinestretch
adjust	adjusts the columns of the LATEX table, default: "r" (right), also possible: "l" (left) and "c" (centre) or user defined: "adjust=c("l","c","r",...)" yields {llcr...}
file	output file, default: printout in console

Value

These functions are called for their side effect to write to a file.

tex.table	generate complete minimal Tex-able .tex file, including 'footnotesize'
tex.tab0	same as 'tex.table' but without 'footnotesize'

Author(s)

Adapted by: Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
 m <- matrix(rnorm(100),nrow=10,ncol=10,dimnames=list(LETTERS[1:10],colnames=letters[1:10]))
 tex.table(m,file="tex.table.tex")
# \begin{tabular}{r|rrrrrrrrrr}
# \hline
# & a & b & c & d & e & f & g & h & i & j\ \hline
# A & -0.63 & 1.51 & 0.92 & 1.36 & -0.16 & 0.40 & 2.40 & 0.48 & -0.57 & -0.54\
# B & 0.18 & 0.39 & 0.78 & -0.10 & -0.25 & -0.61 & -0.04 & -0.71 & -0.14 & 1.21\
# ...
```

triplot *Ternary or Triangular Plots.*

Description

plotCI plots in a triangle the values of three variables. Useful for mixtures (chemistry etc.).

Usage

```
triplot(a, f, m, symb=2, grid=FALSE, ...)
trigrid(grid = FALSE)
```

Arguments

a	Vector of first variable.
f	Vector of second variable.
m	Vector of third variable.
symb	Symbol to be plotted
grid	Plot the grid: TRUE or FALSE
...	Additional parameters for plot

Value

The function tri is called for its side effect to produce a plot. codetrigrid is internal to tri.

Author(s)

Colin Farrow Computing Service, University of Glasgow, Glasgow G12 8QQ
, <c.farrow@compserv.gla.ac.uk>

Examples

```
# some random data in three variables
c1 <- runif(25)
c2 <- runif(25)
c3 <- runif(25)
# basic plot
par(mfrow=c(1,2))
triplot(c1,c2,c3)
# plot with different symbols and a grid
triplot(c1,c2,c3, symb=7, grid=TRUE)
```

w.median *Weighted median*

Description

Compute the weighted median.

Usage

```
w.median (x,w)
```

Arguments

x,w	Real, data and weights

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

See Also

median, quantile

Examples

```
w.median(c(7,1,2,4,10,15),c(1,1/3,1/3,1/3,1/3,1,1)) #  7
w.median(c(1,2,4,7,10,15),c(1/3,1/3,1/3,1/3,1,1,1)) #  7
w.median(c(7,7/3,10,15)) # 7
     # '1','2','4 of weights='1/3' are replaced by '7/3' (weight=1)
w.median(c(7,1,2,4,10),c(1,1/3,1/3,1/3,1/3,1)) #  7
w.median(c(7,1,2,4,10)) #  4
w.median(c(7,1,NA,4,10),c(1,1/3,1/3,1/3,1/3,1)) # 7
```

waitReturn *Wait for <Return>*

Description

Wait for the user to type <Return>, depending on argument.

Usage

```
waitReturn(q="",ask=TRUE)
```

Arguments

ask	TRUE will generate the interruption, FALSE will not.
q	String for prompt

Details

The interruption will only be generated for the interactive use of R and if the call is not sinked (where it would hang the process).

Value

None.

Author(s)

Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
for (ii in 1:5) {
  cat(ii,"\n")
  waitReturn(ii %% 2 == 1)
}
```

---

whole.number *Check an array on whole numbers (x in I).*

Description

whole.number checks an array whether it consists of whole numbers only (x in I).

Usage

```
whole.number(x)
```

Arguments

x	A numerical array.

Value

TRUE, FALSE

Author(s)

Bill Venables adapted by Christian W. Hoffmann <c-w.hoffmann@sunrise.ch>

Examples

```
whole.number(c(pi,2,3)) # FALSE
whole.number(c(1,2,3))  # TRUE
```

Index

∗Topic **NA**
jitterNA, 30
∗Topic **algebra**
div.prot, 16
lengths.angle, 30
pointfit, 47
rotL, 56
∗Topic **arith**
astroC, 5
astroGeo, 6
Const, 9
dc, 13
eql, 19
frac, 23
num.ident, 38
seqm, 59
signp, 61
∗Topic **array**
select.range, 58
∗Topic **character,arith**
convert, 9
functions, 24
numeric, 40
∗Topic **character**
padding, 41
replacechar, 55
∗Topic **chron**
datetime, 13
delayt, 15
dt2str, 17
∗Topic **color**
plotSymbols, 44
∗Topic **data**
jitterNA, 30
whole.number, 68
∗Topic **device**
lpr, 32
panel, 42
∗Topic **distribution**
f.log, 20
Halton, 25
invgauss, 29
my.table, 35
numberof, 40
qnorm.appr, 52
smoothed.df, 62
T3plot, 63
∗Topic **documentation**
cpos, 12
ls.functions, 33
pasteInfix, 42
pasteRound, 43
setPPT, 60
∗Topic **dplot**
ellipse, 18
∗Topic **hplot**
lowess.bygroup, 32
mult.fig.p, 33
panel, 42
plotSymbols, 44
plt, 45
triplot, 66
∗Topic **htest**
shapiro.wilk.test, 60
∗Topic **interface**
tex.table, 64
∗Topic **iplot**
plotSymbols, 44
∗Topic **logic**
is.constant, 29
num.ident, 38
remove.dup.rows, 55
∗Topic **manip**
clean.na, 8
libs, 31
remove.dup.rows, 55
∗Topic **math**
adaptlob, 3

interpol, 27
∗Topic **misc**
cpos, 12
pasteInfix, 42
pasteRound, 43
∗Topic **models**
FinneyCorr, 21
summaryFs, 63
∗Topic **multivariate**
ellipse, 18
∗Topic **print**
cap, 7
datetime, 13
delstr, 15
formatFix, 22
heading, 26
n22dig, 36
n2c, 37
num2Latex, 39
printP, 49
progress.meter, 51
∗Topic **programming**
waitReturn, 67
∗Topic **regression**
FinneyCorr, 21
scode, 57
summaryFs, 63
∗Topic **robust**
w.median, 67
∗Topic **symbolmath**
interpol, 27
∗Topic **utils**
RCA, 54
%&% *(*pasteInfix*)*, 42

adaptlob, 3
adaptsim *(*adaptlob*)*, 3
all.equal, *29*
allDigits *(*convert*)*, 9
as.character, *43*
ASCII *(*Const*)*, 9
astroC, 5
astroGeo, 6
availColors *(*plotSymbols*)*, 44

c1BYPI *(*Const*)*, 9
c1BYSQRTPI *(*Const*)*, 9
c2BYPI *(*Const*)*, 9
c2BYSQRTPI *(*Const*)*, 9
c2PI *(*Const*)*, 9
cAE *(*astroC*)*, 5
cap, 7
capitalize *(*cap*)*, 7
CapLeading *(*cap*)*, 7
capply *(*cap*)*, 7
cat, *43*
catn *(*printP*)*, 49
cC *(*astroC*)*, 5
cDAYPJULCENT *(*astroC*)*, 5
cDAYPMONSID *(*astroC*)*, 5
cDAYPMONSYN *(*astroC*)*, 5
cDAYPYEARSID *(*astroC*)*, 5
cDAYPYEARTROP *(*astroC*)*, 5
cE *(*Const*)*, 9
cEPSOBL *(*astroC*)*, 5
charMat, *45*
charMat *(*n2c*)*, 37
cJDJ2000 *(*astroC*)*, 5
cK *(*astroC*)*, 5
clean.na, 8
cLN10 *(*Const*)*, 9
cLN2 *(*Const*)*, 9
ClockSense2 *(*functions*)*, 24
ClockSense3 *(*functions*)*, 24
Clockwise *(*functions*)*, 24
cLOCKWISE *(*Const*)*, 9
cLOG10E *(*Const*)*, 9
cLOG2E *(*Const*)*, 9
cMAXREALBY38 *(*Const*)*, 9
cMAXREALBY3Q *(*Const*)*, 9
cMY *(*astroC*)*, 5
conf.ellipse *(*ellipse*)*, 18
Const, 9
contfrac *(*convert*)*, 9
convert, 9
CounterClock *(*functions*)*, 24
cPIBY2 *(*Const*)*, 9
cPIBY4 *(*Const*)*, 9
cpos, 12
cPRECESS *(*astroC*)*, 5
cRE *(*astroC*)*, 5
cSBYE *(*astroC*)*, 5
cSBYEMY *(*astroC*)*, 5
cSBYJU *(*astroC*)*, 5
cSBYMA *(*astroC*)*, 5
cSBYME *(*astroC*)*, 5
cSBYNE *(*astroC*)*, 5

cSBYPL (astroC), 5
cSBYSA (astroC), 5
cSBYUR (astroC), 5
cSBYVE (astroC), 5
cSIDBYSOL (astroC), 5
cSOLBYSID (astroC), 5
cSQRT2 (Const), 9
cSQRT2BY2 (Const), 9
cwhmisc-package, 3

datetime, 13, *47*
DAYINMONTH (astroC), 5
dc, 13, *23*
dcn (dc), 13
Degree (convert), 9
delayt, 15
delstr, 15
dev.copy, *33*
dinvgauss (invgauss), 29
div.prot, 16
DPY (astroC), 5
drop, *8*
dt2str, 17

ellipse, 18
eql, 19
equal (functions), 24
equalFuzzy (functions), 24
EuclidExtended (numeric), 40
EulerPhi (numeric), 40
evalcfr (convert), 9
evalInterp (interpol), 27
explainLegend (n2c), 37
expression, *46*

f.log, 20
FALSE, *38*, *68*
FC.lm, *63*
FC.lm (FinneyCorr), 21
FinneyCorr, 21
for, *59*
format, *22*
formatFix, 22
frac, 23
functions, 24

gcd (numeric), 40
GreatestIntAsRealF (Const), 9

Halton, 25
Hd (convert), 9
Hdms (convert), 9
heading, 26
HexDig (Const), 9
histRCT (plt), 45
Hms (convert), 9
Hmsd (convert), 9
HS247 (Halton), 25

identical, *29*
indexLine (n2c), 37
inrange (functions), 24
int (convert), 9
interpol, 27
intToASCII (convert), 9
intToBase (convert), 9
intToHex (convert), 9
intToOct (convert), 9
invgauss, 29
is.constant, 29
IsCounterCl2 (functions), 24
IsCounterCl3 (functions), 24
isNumeric (convert), 9

jitter, *30*
jitterNA, 30

LatBerne (astroGeo), 6
layout, *35*
LB2MK (astroGeo), 6
LB2YX (astroGeo), 6
legend, *64*
lengths.angle, 30
libs, 31
list, *34*
LongBerne (astroGeo), 6
lower (cap), 7
lowerize (cap), 7
lowess.bygroup, 32
lpr, 32
ls.functions, 33

median, *67*
minInterp (interpol), 27
modexp (numeric), 40
modulo (functions), 24
moduloSymm (functions), 24
mpf (dc), 13
mtext, *34*

mult.fig.p, 33
my.table, 35
mydate (datetime), 13
mytime (datetime), 13

n22dig, 36
n2c, *36*, 37
n2cCompact (n2c), 37
n2mfrow, *47*
nchar, *43*
NoneClock (functions), 24
NprinE (printP), 49
NprinL (printP), 49
NprinM (printP), 49
NprinP (printP), 49
NprinT (printP), 49
NprinV (printP), 49
num.ident, 38
num2Latex, 39
numberof, 40
numeric, 40

one (functions), 24
onebyx (functions), 24
options, *39*

padding, 41
panel, 42
par, *33–35*
paste, *43*
pasteInfix, 42
pasteRound, 43
pdfc (lpr), 32
pinvgauss (invgauss), 29
plotmath, *46*
plotSymbols, 44
plotSymbolsFonts (plotSymbols), 44
plt, 45
pltCharMat, *37*
pltCharMat (plt), 45
pltRCT (plt), 45
pn (printP), 49
pointfit, 47
postscript, *47*
powr (functions), 24
PRIMES (Const), 9
prinE (printP), 49
prinL (printP), 49
prinM (printP), 49
prinP (printP), 49
prinT (printP), 49
print, *50*
printP, 49
prinV (printP), 49
progress.meter, 51

qf, *18*
qinvgauss (invgauss), 29
qnorm, *53*
qnorm.ap16 (qnorm.appr), 52
qnorm.app3 (qnorm.appr), 52
qnorm.app4 (qnorm.appr), 52
qnorm.appr, 52
quadmin (interpol), 27
quantile, *67*
quotmean (functions), 24

R2.lm (FinneyCorr), 21
Radian (convert), 9
RC (RCA), 54
RCA, 54
ReduceArc (convert), 9
ReduceArc2 (convert), 9
remove.dup.rows, 55
replacechar, 55
rinvgauss (invgauss), 29
rotaP (rotL), 56
rotL, *18*, *48*, 56
rotPz (rotL), 56
round, *43*

s.lm, *63*
s.lm (FinneyCorr), 21
safeDiv (functions), 24
scm (numeric), 40
scode, 57
select.range, 58
seq, *59*
seqm, 59
setPPT, 60
setupInterp (interpol), 27
shapiro.test, *61*
shapiro.wilk.test, 60
sign, *61*
signp, 61
smoothed.df, 62
solveQeq (functions), 24
source, *45*

spacC (Const), 9
splom, *47*
SplomT (plt), 45
sprintf, *14*, *43*
sqr (functions), 24
str2dig (convert), 9
strsplit, *43*
substr, *43*
substring.location (cpos), 12
summaryFs, 63
Sweave, *13*

T3plot, 63
table, *35*
tex.tab0 (tex.table), 64
tex.table, 64
toFrac (convert), 9
ToPolar (convert), 9
ToRect (convert), 9
trigrid (triplot), 66
triplot, 66
TRUE, *38*, *68*

w.median, 67
waitReturn, 67
whole.number, 68

xToBase (convert), 9
xToNorthBerne (astroGeo), 6
XXXadaptlobstp (adaptlob), 3
XXXadaptsimstp (adaptlob), 3
XXXcl (cap), 7

yToEastBerne (astroGeo), 6
YX2LB (astroGeo), 6
YX2MK (astroGeo), 6

zero (functions), 24