

# Package ‘cec2005benchmark’

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**Description** This package is a wrapper for the C implementation of the 25 benchmark functions for the CEC 2005 Special Session on Real-Parameter Optimization. The original C code by Santosh Tiwari and related documentation are available at [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

**License** GPL (>= 3)

**URL** <https://github.com/yasserglez/cec2005benchmark>

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cec2005benchmark	<i>Benchmark Functions</i>
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## Description

Common interface to all benchmark functions

## Usage

```
cec2005benchmark(i, x)
```

## Arguments

i	Function number between 1 and 25
x	Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

## Value

A vector with the evaluation of the function for each row of x

## References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

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cec2005benchmark1      *Function Number 1*

---

### Description

Shifted Sphere Function

- $x \in [-100, 100]^D$
- Global optimum  $F(x^*) = -450$

### Usage

`cec2005benchmark1(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark1(runif(10, -100, 100))`

---

cec2005benchmark10      *Function Number 10*

---

### Description

Shifted Rotated Rastrigin's Function

- $x \in [-5, 5]^D$
- Global optimum  $F(x^*) = -330$

### Usage

`cec2005benchmark10(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark10(runif(10, -5, 5))`

---

cec2005benchmark11      *Function Number 11*

---

### Description

Shifted Rotated Weierstrass Function

- $x \in [-0.5, 0.5]^D$
- Global optimum  $F(x^*) = 90$

### Usage

`cec2005benchmark11(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark11(runif(10, -0.5, 0.5))`

---

cec2005benchmark12      *Function Number 12*

---

### Description

Schwefel's Problem 2.13

- $x \in [-\pi, \pi]^D$
- Global optimum  $F(x^*) = -460$

### Usage

`cec2005benchmark12(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark12(runif(10, -pi, pi))`

---

cec2005benchmark13      *Function Number 13*

---

### Description

Shifted Expanded Griewank's plus Rosenbrock's Function (F8F2)

- $x \in [-5, 5]^D$
- Global optimum  $F(x^*) = -130$

### Usage

`cec2005benchmark13(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark13(runif(10, -5, 5))`

---

cec2005benchmark14      *Function Number 14*

---

### Description

Shifted Rotated Expanded Scaffer's F6 Function

- $x \in [-100, 100]^D$
- Global optimum  $F(x^*) = -300$

### Usage

`cec2005benchmark14(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark14(runif(10, -100, 100))`



---

cec2005benchmark15      *Function Number 15*

---

### Description

Hybrid Composition Function

- $x \in [-5, 5]^D$
- Global optimum  $F(x^*) = 120$

### Usage

`cec2005benchmark15(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark15(runif(10, -5, 5))`

---

cec2005benchmark16      *Function Number 16*

---

### Description

Rotated Version of Hybrid Composition Function F15

- $x \in [-5, 5]^D$
- Global optimum  $F(x^*) = 120$

### Usage

`cec2005benchmark16(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark16(runif(10, -5, 5))`

---

cec2005benchmark17      *Function Number 17*

---

**Description**

F16 with Noise in Fitness

- $x \in [-5, 5]^D$
- Global optimum  $F(x^*) = 120$

**Usage**

`cec2005benchmark17(x)`

**Arguments**

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

**Value**

A vector with the evaluation of the function for each row of `x`

**References**

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

**See Also**

[cec2005benchmark](#)

**Examples**

`cec2005benchmark17(runif(10, -5, 5))`

---

cec2005benchmark18      *Function Number 18*

---

### Description

Rotated Hybrid Composition Function

- $x \in [-5, 5]^D$
- Global optimum  $F(x^*) = 10$

### Usage

`cec2005benchmark18(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark18(runif(10, -5, 5))`

---

cec2005benchmark19      *Function Number 19*

---

### Description

Rotated Hybrid Composition Function with a Narrow Basin for the Global Optimum

- $x \in [-5, 5]^D$
- Global optimum  $F(x^*) = 10$

### Usage

`cec2005benchmark19(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark19(runif(10, -5, 5))`

---

cec2005benchmark2      *Function Number 2*

---

### Description

Shifted Schwefel's Problem 1.2

- $x \in [-100, 100]^D$
- Global optimum  $F(x^*) = -450$

### Usage

`cec2005benchmark2(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark2(runif(10, -100, 100))`

---

cec2005benchmark20      *Function Number 20*

---

### Description

Rotated Hybrid Composition Function with Global Optimum on the Bounds

- $x \in [-5, 5]^D$
- Global optimum  $F(x^*) = 10$

### Usage

`cec2005benchmark20(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark20(runif(10, -5, 5))`

---

cec2005benchmark21      *Function Number 21*

---

### Description

Rotated Hybrid Composition Function

- $x \in [-5, 5]^D$
- Global optimum  $F(x^*) = 360$

### Usage

`cec2005benchmark21(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark21(runif(10, -5, 5))`



---

cec2005benchmark22      *Function Number 22*

---

### Description

Rotated Hybrid Composition Function with High Condition Number Matrix

- $x \in [-5, 5]^D$
- Global optimum  $F(x^*) = 360$

### Usage

`cec2005benchmark22(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark22(runif(10, -5, 5))`

---

cec2005benchmark23      *Function Number 23*

---

### Description

Non-Continuous Rotated Hybrid Composition Function

- $x \in [-5, 5]^D$
- Global optimum  $F(x^*) = 360$

### Usage

`cec2005benchmark23(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark23(runif(10, -5, 5))`

---

cec2005benchmark24      *Function Number 24*

---

### Description

Rotated Hybrid Composition Function

- $x \in [-5, 5]^D$
- Global optimum  $F(x^*) = 260$

### Usage

`cec2005benchmark24(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark24(runif(10, -5, 5))`

---

cec2005benchmark25      *Function Number 25*

---

### Description

Rotated Hybrid Composition Function without bounds

- $x \in [2, 5]^D$
- Global optimum  $F(x^*) = 260$

### Usage

`cec2005benchmark25(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark25(runif(10, -5, 5))`

---

cec2005benchmark3      *Function Number 3*

---

### Description

Shifted Rotated High Conditioned Elliptic Function

- $x \in [-100, 100]^D$
- Global optimum  $F(x^*) = -450$

### Usage

`cec2005benchmark3(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark3(runif(10, -100, 100))`

---

cec2005benchmark4      *Function Number 4*

---

### Description

Shifted Schwefel's Problem 1.2 with Noise in Fitness

- $x \in [-100, 100]^D$
- Global optimum  $F(x^*) = -450$

### Usage

`cec2005benchmark4(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark4(runif(10, -100, 100))`

---

cec2005benchmark5      *Function Number 5*

---

### Description

Schwefel's Problem 2.6 with Global Optimum on Bounds

- $x \in [-100, 100]^D$
- Global optimum  $F(x^*) = -310$

### Usage

`cec2005benchmark5(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark5(runif(10, -100, 100))`

---

cec2005benchmark6      *Function Number 6*

---

### Description

Shifted Rosenbrock's Function

- $x \in [-100, 100]^D$
- Global optimum  $F(x^*) = 390$

### Usage

`cec2005benchmark6(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark6(runif(10, -100, 100))`



---

cec2005benchmark7      *Function Number 7*

---

### Description

Shifted Rotated Griewank's Function without Bounds

- $x \in [0, 600]^D$
- Global optimum  $F(x^*) = -180$

### Usage

`cec2005benchmark7(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark7(runif(10, 0, 600))`

---

cec2005benchmark8      *Function Number 8*

---

### Description

Shifted Rotated Ackley's Function with Global Optimum on Bounds

- $x \in [-32, 32]^D$
- Global optimum  $F(x^*) = -140$

### Usage

`cec2005benchmark8(x)`

### Arguments

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

### Value

A vector with the evaluation of the function for each row of `x`

### References

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

### See Also

[cec2005benchmark](#)

### Examples

`cec2005benchmark8(runif(10, -32, 32))`

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cec2005benchmark9      *Function Number 9*

---

**Description**

Shifted Rastrigin's Function

- $x \in [-5, 5]^D$
- Global optimum  $F(x^*) = -330$

**Usage**

`cec2005benchmark9(x)`

**Arguments**

`x`                      Either a vector with 2, 10, 30 or 50 elements or a matrix with the same number of columns and one row for each vector to be evaluated

**Value**

A vector with the evaluation of the function for each row of `x`

**References**

P. N. Suganthan, N. Hansen, J. J. Liang, K. Deb, Y.-P. Chen, A. Auger, S. Tiwari (2005). Problem Definitions and Evaluation Criteria for the CEC 2005 Special Session on Real-Parameter Optimization, Technical report, Nanyang Technological University, Singapore, May 2005, [http://www.ntu.edu.sg/home/EPNSugan/index\\_files/CEC-05/CEC05.htm](http://www.ntu.edu.sg/home/EPNSugan/index_files/CEC-05/CEC05.htm).

**See Also**

[cec2005benchmark](#)

**Examples**

`cec2005benchmark9(runif(10, -5, 5))`

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