# Method



cember 2018, 2:37 AM
ember 2018, 12:17 AM
.00 (**92**%)

## QUIZ NAVIGATION

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ormulas shown during this course to estimate values for derivatives, we want the error to be as small ✓ as possible.
or accuracy, a formula with an error of

$$O(h^2)$$

✓ than a formula with an error of

$$O(h)$$

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ver is:
ormulas shown during this course to estimate values for derivatives, we want the error to be as [small] as possible. For this racy, a formula with an error of

$$O(h^2)$$

is [better] than a formula with an error of

$$O(h)$$

Question **2**
Correct
Mark 1.00 out of 1.00
Flag question

What is the high accuracy formula for the backward estimate of the second derivative?

Select one:

a.
$$f''(x_i) = \frac{f(x_i) - f(x_{i-1}) + f(x_{i-2}) - f(x_{i-3})}{h^2}$$

b.
$$f''(x_i) = \frac{-f(x_{i+2}) + 4f(x_{i+1}) - 3f(x_i)}{2h}$$

c.
$$f''(x_i) = \frac{2f(x_i) - 5f(x_{i-1}) + 4f(x_{i-2}) - f(x_{i-3})}{h^2}$$
✓

d.
$$f''(x_i) = \frac{2f(x_i) - 5f(x_{i-1}) + 4f(x_{i-2}) - f(x_{i-3})}{2h}$$

The correct answer is:

$$f''(x_i) = \frac{2f(x_i) - 5f(x_{i-1}) + 4f(x_{i-2}) - f(x_{i-3})}{h^2}$$

Question **3**
Correct
Mark 1.00 out of 1.00
Flag question

What is the formula for the centered estimate of the first derivative of

$$f$$

that has an

$$O(h^4)$$

error term?

Select one:

a.
$$f'(x_i) = \frac{-f(x_{i+2}) + 8f(x_{i+1}) - 8f(x_{i-1}) + f(x_{i-2})}{12h}$$
✓

b.
$$f'(x_i) = \frac{-f(x_{i+2}) + 8f(x_{i+1}) - 8f(x_{i-1}) + f(x_{i-2})}{h^2}$$

c.
$$f'(x_i) = \frac{-f(x_{i+2}) + 6f(x_{i+1}) - 6f(x_{i-1}) + f(x_{i-2})}{12h}$$

d.
$$f'(x_i) = \frac{f(x_{i+1}) - f(x_{i-1})}{2h}$$

The correct answer is:

$$f'(x_i) = \frac{-f(x_{i+2}) + 8f(x_{i+1}) - 8f(x_{i-1}) + f(x_{i-2})}{12h}$$

Question **4**
Correct
Mark 1.00 out of 1.00
Flag question

What is the formula for the order

$$h$$

forward estimate of the derivative of

$$f$$

at

$$x_i$$

with step size

$$h$$

.

Select one:

a.

$$f'(x_i) = \frac{f(x_{i+1}) - f(x_i)}{h}$$

✓

b.

$$f'(x_i) = \frac{f(x_{i+1}) - f(x_i)}{h^2}$$

c.

$$f'(x_i) = \frac{f(x_{i+2}) - 2f(x_{i+1} + f(x_i))}{h^2}$$

d.

$$f'(x_i) = \frac{f(x_i) - f(x_{i-1})}{h}$$

The correct answer is:

$$f'(x_i) = \frac{f(x_{i+1}) - f(x_i)}{h}$$

Question **5**
Correct
Mark 1.00 out of 1.00
Flag question

Under what circumstances can use Richardson extrapolation to get better estimates?

Select one:

- a. When we have a formula for estimating a value that has an error term than can be expressed using a power series ✓
- b. When the function can be modelled by a freely converging continuous Romberg power series
- c. When Taylor's series converges
- d. When our values are Romberg integrable

The correct answer is: When we have a formula for estimating a value that has an error term than can be expressed using a power series

Question **6**
Correct
Mark 1.00 out of 1.00
Flag question

What is the formula for calculating the terms

$$R(n, k)$$

for

$$k > 0$$

using the Romberg method?

Select one:

a.

$$R(n, k) = \frac{kR(n, k-1) - R(n-1, k-1)}{k-1}$$

b.

$$R(n, k) = \frac{4^k R(n, k-1) - R(n-1, k-1)}{4^k - 1}$$

✓

c.

$$R(n, k) = \frac{R(n, k-1) + R(n-1, k-1)}{2}$$

d.

$$R(n, k) = \frac{4R(n, k-1) - R(n-1, k-1)}{3}$$

The correct answer is:

$$R(n,k) = \frac{4^k R(n,k-1) - R(n-1,k-1)}{4^k - 1}$$

Question **7**
Correct
Mark 1.00 out of 1.00
Flag question

The Romberg estimates

$$R(n, 1)$$

for

$$n \geq 0$$

are equivalent to which integral estimate with

$$2^n$$

segments?

Select one:
- a. Richardson extrapolation
- b. Simpson's 3/8 rule
- c. The composite trapezoid rule
- d. Composite Simpson's 1/3 rule ✓

The correct answer is: Composite Simpson's 1/3 rule

Question **8**
Correct
Mark 1.00 out of 1.00
Flag question

Given a function

$$f(x)$$

what is the name for the series

$$f(a) + f'(a)(x-a) + \frac{f''(a)}{2}(x-a)^2 + \frac{f^{(3)}(a)}{3!}(x-a)^3 + \ldots ?$$

Select one:
- a. Simpson's series
- b. Euler's series
- c. Taylor's series ✓
- d. Newton's series

The correct answer is: Taylor's series

Question **9**
Correct
Mark 1.00 out of 1.00
Flag question

Suppose we have a function

$$f$$

and that

$$f(0) = 2.4$$

$$f(0.5) = 4.5$$

Use the lower accuracy centered difference formula to estimate the first derivative of

$$f$$

at

$$x = 0.25$$

Give your answer to 1 decimal place.

Answer: 4.2 ✓

The correct answer is: 4.2

Question **10**
Incorrect
Mark 0.00 out of 1.00
Flag question

Suppose we have a function

$$f$$

and that

$$f(0) = 13.4$$

$$f(0.5) = 9.8$$

$$f(1) = 13.6$$

Use the lower accuracy forward difference formula to estimate the second derivative of

$$f$$

at

$$x = 0$$

Give your answer to 1 decimal place.

Answer: 7.4 ✗

The correct answer is: 29.6

Question **11**
Correct
Mark 1.00 out of 1.00

Suppose we have a function

$$f$$

Flag question

and that

$$f(1) = 3.6$$

$$f(1.25) = 3.8$$

$$f(1.5) = 5.3$$

$$f(1.75) = 1.2$$

$$f(2) = 7.2$$

Use the higher accuracy centered difference formula to estimate the second derivative of

$$f$$

at

$$x = 1.5$$

Give your answer to 1 decimal place.

Answer: -119.7

The correct answer is: -119.7

Question 12
Correct
Mark 1.00 out of 1.00
Flag question

Suppose we use the composite trapezoid rule to estimate the value of an integral. Suppose we do two estimates, one using

$$h_0 = 0.5$$

and another using

$$h_1 = 0.25$$

Suppose the first estimate produces

$$I_0 = 63.6$$

and the second estimate produces

$$I_1 = 52.4$$

Combine these estimates into a better one using the Romberg method. Give your answer to 2 decimal places.

Answer: 48.67

The correct answer is: 48.67

Finish review