

Calculus Practice: Mean Value Theorem 1b

For each problem, determine if the Mean Value Theorem can be applied. If it can, find all values of c that satisfy the theorem. If it cannot, explain why not.

1) $f(x) = -2x^2 - 8x - 4$; $[-3, 0]$

2) $f(x) = x^2 - 8x + 12$; $[2, 5]$

3) $y = -x^2$; $[-1, 1]$

4) $f(x) = \frac{x^2}{2} + 4x + 8$; $[-5, -1]$

5) $f(x) = x^2 + 4x + 5$; $[-4, 0]$

6) $f(x) = x^3 - 2x^2 - 4$; $[0, 3]$

7) $y = x^3 - 4x^2 + 5x + 2$; $[0, 2]$

8) $y = x^3 - 4x^2 + 5$; $[1, 3]$

9) $f(x) = -x^3 + 4x^2 - 6$; $[-1, 2]$

10) $y = x^3 - 4x^2 + 7$; $[1, 3]$

11) $f(x) = -\frac{x^2}{3x-6}$; $[-1, 3]$

12) $y = -\frac{x^2}{4x-8}$; $[-2, 1]$

13) $y = \frac{-x^2+1}{3x}$; $[1, 6]$

14) $f(x) = \frac{-x^2+4}{3x}$; $[1, 5]$

15) $y = \frac{x^2}{3x+3}$; $[-2, 2]$

16) $f(x) = (4x-12)^{\frac{2}{3}}$; $[2, 5]$

17) $y = -(3x+18)^{\frac{2}{3}}$; $[-6, -1]$

18) $y = (6x-30)^{\frac{2}{3}}$; $[3, 6]$

19) $f(x) = (4x-4)^{\frac{2}{3}}$; $[1, 3]$

20) $f(x) = -(x+1)^{\frac{2}{3}}$; $[-4, 0]$

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For each problem, determine if the Mean Value Theorem can be applied. If it can, find all values of c that satisfy the theorem. If it cannot, explain why not.

1) $f(x) = -2x^2 - 8x - 4$; $[-3, 0]$

$$\left\{ -\frac{3}{2} \right\}$$

2) $f(x) = x^2 - 8x + 12$; $[2, 5]$

$$\left\{ \frac{7}{2} \right\}$$

3) $y = -x^2$; $[-1, 1]$

$$\{0\}$$

4) $f(x) = \frac{x^2}{2} + 4x + 8$; $[-5, -1]$

$$\{-3\}$$

5) $f(x) = x^2 + 4x + 5$; $[-4, 0]$

$$\{-2\}$$

6) $f(x) = x^3 - 2x^2 - 4$; $[0, 3]$

$$\left\{ \frac{2 + \sqrt{13}}{3} \right\}$$

7) $y = x^3 - 4x^2 + 5x + 2$; $[0, 2]$

$$\left\{ \frac{2}{3} \right\}$$

8) $y = x^3 - 4x^2 + 5$; $[1, 3]$

$$\left\{ \frac{4 + \sqrt{7}}{3} \right\}$$

9) $f(x) = -x^3 + 4x^2 - 6$; $[-1, 2]$

$$\left\{ \frac{4 - \sqrt{13}}{3} \right\}$$

10) $y = x^3 - 4x^2 + 7$; $[1, 3]$

$$\left\{ \frac{4 + \sqrt{7}}{3} \right\}$$

11) $f(x) = -\frac{x^2}{3x-6}$; $[-1, 3]$

The function is not continuous on $[-1, 3]$

12) $y = -\frac{x^2}{4x-8}$; $[-2, 1]$

$$\{0\}$$

13) $y = \frac{-x^2 + 1}{3x}$; $[1, 6]$

$$\{\sqrt{6}\}$$

14) $f(x) = \frac{-x^2 + 4}{3x}$; $[1, 5]$

$$\{\sqrt{5}\}$$

15) $y = \frac{x^2}{3x+3}$; $[-2, 2]$

The function is not continuous on $[-2, 2]$

16) $f(x) = (4x - 12)^{\frac{2}{3}}$; $[2, 5]$

The function is not differentiable on $(2, 5)$

17) $y = -(3x + 18)^{\frac{2}{3}}$; $[-6, -1]$

$$\left\{ -\frac{122}{27} \right\}$$

18) $y = (6x - 30)^{\frac{2}{3}}$; $[3, 6]$

The function is not differentiable on $(3, 6)$

19) $f(x) = (4x - 4)^{\frac{2}{3}}$; $[1, 3]$

$$\left\{ \frac{43}{27} \right\}$$

20) $f(x) = -(x + 1)^{\frac{2}{3}}$; $[-4, 0]$

The function is not differentiable on $(-4, 0)$