

Calculus Practice 2.4A1: Mean Value Theorem 1a

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) $y = -\frac{x^2}{2} + 4x - 2$; $[4, 7]$

- A) $\{6\}$ B) $\left\{\frac{11}{2}\right\}$
 C) $\left\{\frac{13}{2}\right\}$ D) $\{5\}$

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

- A) $\left\{-\frac{5}{2}\right\}$ B) $\left\{-\frac{7}{2}\right\}$
 C) $\{-3\}$ D) $\{-2\}$

3) $y = -\frac{x^2}{2} - 4x - 9$; $[-5, -2]$

- A) $\left\{-\frac{7}{2}\right\}$ B) $\{-3\}$
 C) $\{-4\}$ D) $\left\{-\frac{9}{2}\right\}$

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

- A) $\left\{\frac{1}{2}\right\}$ B) $\{1\}$
 C) $\{2\}$ D) $\{0\}$

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

- A) $\left\{\frac{2 + \sqrt{7}}{3}\right\}$ B) $\left\{\frac{4}{3}\right\}$
 C) $\{1\}$ D) $\left\{\frac{2 + \sqrt{13}}{3}\right\}$

6) $y = x^3 - 3x^2 - 1$; $[0, 3]$

- A) $\{2\}$ B) $\{1 + \sqrt{3}\}$
 C) $\left\{\frac{3 + 2\sqrt{3}}{3}\right\}$ D) $\left\{\frac{3 + \sqrt{21}}{3}\right\}$

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

- A) $\left\{\frac{2 - \sqrt{13}}{3}\right\}$ B) $\left\{\frac{2 - \sqrt{19}}{3}\right\}$
 C) $\left\{\frac{2 - \sqrt{7}}{3}\right\}$ D) $\left\{-\frac{2}{3}\right\}$

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

- A) $\left\{\frac{4 - \sqrt{43}}{3}\right\}$ B) $\left\{\frac{4 - \sqrt{13}}{3}\right\}$
 C) $\left\{-\frac{1}{3}\right\}$ D) $\left\{\frac{4 - \sqrt{19}}{3}\right\}$

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

- A) The function is not continuous on $[-3, 0]$
 B) $\{-2\}$
 C) $\{-1 - \sqrt{3}\}$
 D) The function is not differentiable on $(-3, 0)$

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

- A) The function is not differentiable on $(-1, 4)$
 B) $\{\sqrt{6}\}$
 C) The function is not continuous on $[-1, 4]$
 D) $\{2\}$

11) $y = -\frac{x^2}{3x+6}; [-5, -1]$

- A) The function is not differentiable on $(-5, -1)$
- B) $\{-2 - \sqrt{3}\}$
- C) The function is not continuous on $[-5, -1]$
- D) $\{-2 - \sqrt{5}\}$

12) $y = \frac{x^2 - 1}{2x}; [-5, -1]$

- A) $\{-\sqrt{3}\}$
- B) $\{-\sqrt{5}\}$
- C) The function is not continuous on $[-5, -1]$
- D) The function is not differentiable on $(-5, -1)$

13) $f(x) = (5x + 25)^{\frac{2}{3}}; [-6, -3]$

- A) $\left\{-\frac{53}{9}\right\}$
- B) $\left\{-\frac{151}{27}\right\}$
- C) The function is not differentiable on $(-6, -3)$
- D) The function is not continuous on $[-6, -3]$

14) $y = (2x + 12)^{\frac{2}{3}}; [-6, -3]$

- A) $\left\{-\frac{46}{9}\right\}$
- B) The function is not differentiable on $(-6, -3)$
- C) The function is not continuous on $[-6, -3]$
- D) $\{-4\}$

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

- A) $\left\{-\frac{17}{9}\right\}$
- B) $\left\{-\frac{59}{27}\right\}$
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16) $y = -(x + 1)^{\frac{2}{3}}; [-1, 4]$

- A) $\left\{\frac{13}{27}\right\}$
- B) The function is not continuous on $[-1, 4]$
- C) $\{0\}$
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