Practice Problems

Name:________________________________

Identify all critical numbers and locate the absolute extrema of the function on the closed interval. Show all the Calculus that leads to your conclusion, the derivative, the location of critical numbers and the value of each extrema.

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

2. $f(x) = \cos 2x \ [0, \pi]$

3. Let f be a continuous function on [-4, 12]. If f(-4)=-2 and f(12)=6, then the Mean Value Theorem guarantees that

A. f(4) = 2.

B. $f'(4) = \frac{1}{2}$

C. $f'(c) = \frac{1}{2}$ for at least one c between -4 and 12.

D. $f(c) = 0$ for at least one c between -4 and 12.

E. f(4) = 0.

4. The value of c that satisfies the Mean Value Theorem for Derivatives on the interval [0,5] for the function $f(x) = x^3 - 6x$ is

A. $-\frac{5}{\sqrt{3}}$ B. 0 C. 1

D. $\frac{5}{3}$ E. $\frac{5}{\sqrt{3}}$

5. Determine the value for c on [2,5] that satisfies the Mean Value Theorem for $f(x) = \frac{x^2 - 3}{x - 1}$

A. -1 B. 2 C. 3

D. 4 E. 5

6. The function f is continuous for $-2 \le x \le 1$ and differentiable for $-2 < x < 1$. If $f(-2) = -5$ and $f(1) = 4$, which of the following statements could be false?

(A) There exists c, where $-2 < c < 1$, such that $f(c) = 0$.
(B) There exists c, where $-2 < c < 1$, such that $f(c) = 3$.
(C) There exists c, where $-2 < c < 1$, such that $f'(c) = 0$.
(D) There exists c, where $-2 < c < 1$, such that $f'(c) = 3$.
(E) There exists c, where $-2 \le c \le 1$, such that $f(c) \ge f(x)$ for all x on the closed interval $-2 \le x \le 1$.

7. Let f be a function that is differentiable on the open interval (1, 10). If $f(2) = -5$, $f(5) = 5$, and $f(9) = -5$, which of the following must be true?

I. f has at least 2 zeros.
II. The graph of f has at least one horizontal tangent.
III. For some c, $2 < c < 5$, $f(c) = 3$.

(A) None (B) I only (C) I and II only

(D) I and III only (E) I, II and III

8. Let f be the function given by $f(x) = |x|$. Which of the following statements about f are true?

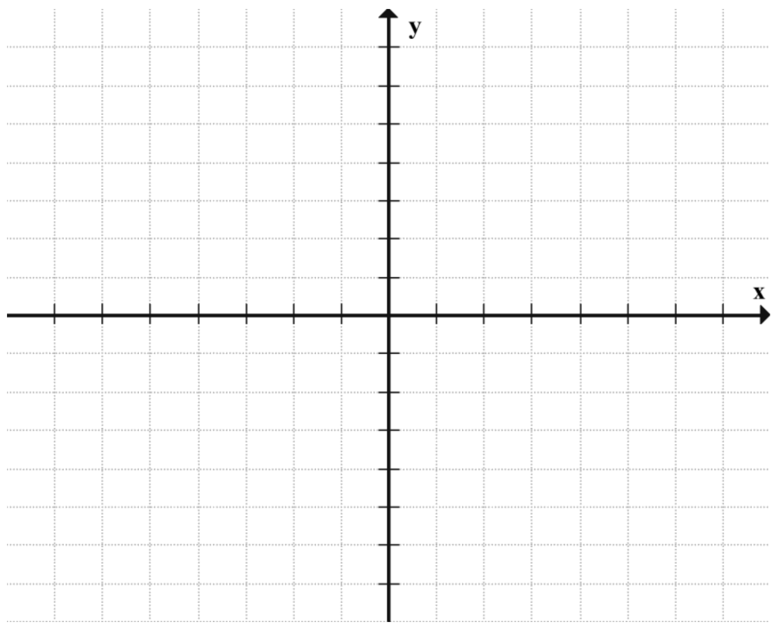
I. f is continuous at $x = 0$.
II. f is differentiable at $x = 0$.
III. f has an absolute minimum at $x = 0$.

(A) I only (B) II only (C) III only

(D) I and III only (E) II and III only

9. $f(x) = x^3 - 3x^2$

Sketch a graph of f(x) labeling all relative extrema and points of inflection.



$f'(x) =$ ______________

Critical Values: _______________

Interval(s) of increase: _______________

Interval(s) of decrease: _______________

$f''(x) = =$ ______________

PPOIs: ___________________________

Interval(s) of concave up: ________________________

Interval(s) of concave down: ________________________