

Lab Time:

Your Name:

GOAL: This quiz is designed to illuminate your understanding of how to analyze the graphical behavior of functions in terms of extrema, concavity and derivatives..

1. (12 points) **Multiple Choice.** Indicate your answer to the following multiple choice questions (1 point) by selecting the appropriate box. Your explanation of your answer is worth 2 points.

(a). Which of the following statements is always true?

- (A) All local extrema are also global extrema.
- (B) All global extrema are also local extrema.
- (C) Some global extrema are local extrema.
- (D) No local extrema are global extrema.
- (E) None of the above statements is true.

(b). Consider an unknown function $g(x)$ where $g'(x) = x^2(x - 2)$. It has

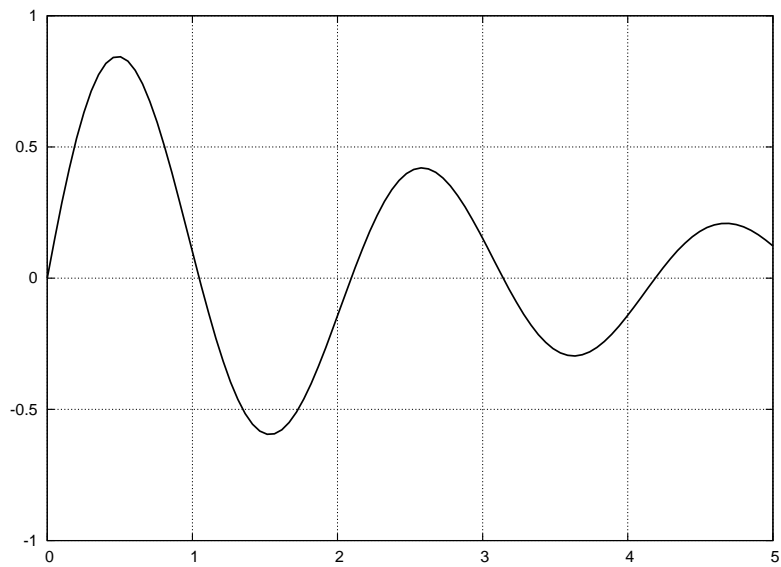
- (A) no inflection points.
- (B) one inflection point.
- (C) two inflection points.
- (D) three inflection points.
- (E) an unknowable number of inflection points.

(c). Consider an unknown function $g(x)$ where $g'(x) = x^2(x - 2)$. It has

- (A) no critical points.
- (B) one critical point.
- (C) two critical points.
- (D) three critical points.
- (E) an unknowable number of inflection points.

(d). Consider an unknown function $M(x)$ where all you know is that $M(x)$ is decreasing at every point in the interval $[0, 3]$. Which of the following must be true?

- (A) $M(x)$ has a local minimum at $x = 2$.
- (B) $M(x)$ has a global minimum at $x = 2$.
- (C) $M(x)$ has a local maximum at $x = 2$.
- (D) $M(x)$ has a global maximum at $x = 2$.
- (E) More than one of the above statements must be true.



2. (8 points) Consider the graph of the function $f(x) = e^{-0.2x} \sin(x)$ on $[0, 5]$. Label **all** local maxima with **LMax**; similarly, label **all** local minima with **LMin**. Then, label **all** global maxima with **GMax**; similarly, label **all** global minima with **GMin**.

BONUS (5 points) Consider the function $F(x) = x^2 e^{-x}$. Sketch a graph of the function $F(x)$ on its domain after clearly identifying the locations of all extrema and inflection points.