

Semester 1 - Unit 5 Review

AP Calc. AB/BC

The first derivative of the function f is defined by $f'(x) = \sin(2x)$ for $0 < x \leq 3$. On what intervals is f decreasing?

An ant is walking along the curve $x^2 + xy + y^2 = 19$. If the ant is moving to the **right** at the rate of 3 cm/sec, how fast is the ant moving **up or down** when the ant reaches the point $(2, 3)$. Be sure you specify direction.

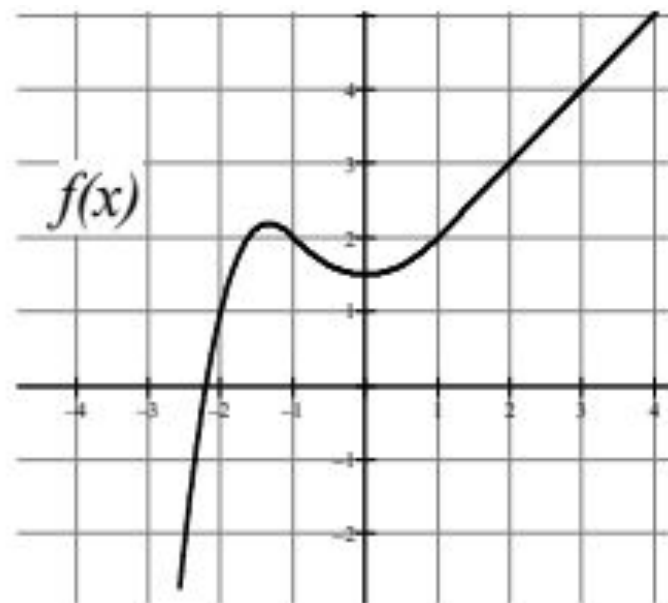
Let f be a function such that $f''(x) > 0$ for all x in the closed interval $[0, 1]$. Selected values of f are shown in the table below.

x	0.4	0.5	0.6	0.7
$f(x)$	5.76	5.46	5.29	5.14

Which of the following must be true about $f'(0.5)$?

- (A) $f'(0.5) < -3$ (B) $-3 < f'(0.5) < -1.7$ (C) $-1.7 < f'(0.5) < -1.4$
(D) $-1.4 < f'(0.5) < 0$ (E) $f'(0.5) > 0$

Sketch the derivative of the given function.



A particle moves along the x -axis with velocity given by $v(t) = \frac{10 \sin(0.4t^2)}{t^2 - t + 3}$ for time $0 \leq t \leq 3.5$ where t is measured in minutes, and v is measured in feet per minute.

- Find the acceleration of the particle at time $t = 2$.
- Is the particle moving to the left or right at $t = 2$? Justify your answer with specific values.

At time $t \geq 0$, the position of a particle moving along the x -axis is given by $x(t) = \frac{t^3}{3} + 2t + 2$. For what value of t in the interval $[0,3]$ will the instantaneous velocity of the particle equal the average velocity of the particle from time $t = 0$ to time $t = 3$?

(A) 1

(B) $\sqrt{3}$

(C) $\sqrt{7}$

(D) 3

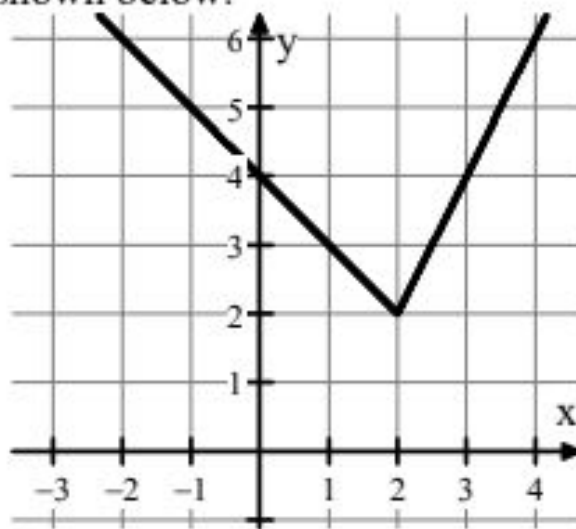
(E) 5

A rectangle is formed in Quadrant I with one side on the x -axis, another on the y -axis, and the corner opposite the origin on the graph $y = 9 - x^2$. Find the dimensions of the rectangle with the largest area.

The derivative of g is given by $g'(x) = x^3(4 - x)(x - 2)$. Find all relative extrema and justify your conclusions.

A particle's position along the y -axis is measured by $y(t) = t^3 - 2t^2 - 4t$ where $t > 0$. Find the intervals where the particle is slowing down.

7. The graph of the function h is shown below.



Graph of h

If f is the function given by $f(x) = h(h(x))$, what is the value of $f'(1)$?

(A) 3

(B) -1

(C) 5

(D) -4

(E) -2

1. The third derivative of the function f is continuous on the interval $(1, 6)$. Values for f and its first three derivatives at $x = 5$ are given in the table below. What is $\lim_{x \rightarrow 5} \frac{f(x)}{(x-5)^2}$?

x	$f(x)$	$f'(x)$	$f''(x)$	$f'''(x)$
5	0	0	-1	6

- (A) $-\frac{1}{2}$ (B) $-\frac{1}{5}$ (C) -1 (D) 6 (E) The limit does not exist.

Answer Key:

Semester 1 - Unit 5 Review - Answer Key