1. (2 pts) Consider the function $f(x)$ graphed below.
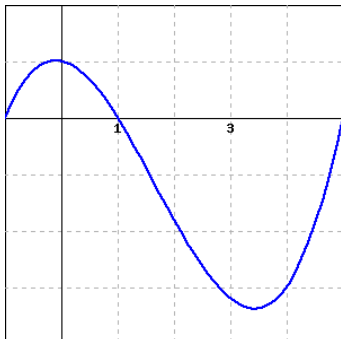

For this function, are the following nonzero quantities positive or negative?

$f(0.5)$ is $\boxed{?}$

$f'(0.5)$ is $\boxed{?}$
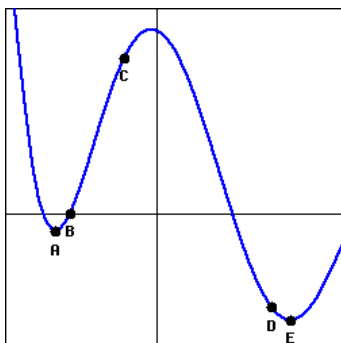
$f''(0.5)$ is $\boxed{?}$

(Because this is a multiple choice problem, it will not show which parts of the problem are correct or incorrect when you submit it.)

Answer(s) submitted:

-
-
-

(incorrect)

---

2. (3 pts) At exactly two of the labeled points in the figure below, which shows a function f, the derivative f' is zero; the second derivative f'' is not zero at any of the labeled points. Select the correct signs for each of f, f' and f'' at each marked point.

Point	A	B	C	D	E
f	?	?	?	?	?
f'	?	?	?	?	?
f''	?	?	?	?	?

Answer(s) submitted:

-
-
-
-
-
-
-
-
-
-
-
-
-
-
-

(incorrect)

---

3. (2 pts) The position of a particle moving along the x-axis is given by $s(t) = 3t^2 + 6$. Use difference quotients to find the velocity $v(t)$ and acceleration $a(t)$, filling in the following expressions as you do so:

$v(t) = \lim\limits_{h \to 0} [\underline{\hspace{3cm}} / h] = \underline{\hspace{1.5cm}}$

$a(t) = \lim\limits_{h \to 0} [\underline{\hspace{3cm}} / h] = \underline{\hspace{1.5cm}}$

Answer(s) submitted:

-
-
-
-

(incorrect)

---

4. (1 pt) Suppose that an accelerating car goes from 0 mph to 57.3 mph in five seconds. Its velocity is given in the following table, converted from miles per hour to feet per second, so that all time measurements are in seconds. (Note: 1 mph is 22/15 ft/sec.) Find the average acceleration of the car over each of the first two seconds.

t (s)	0	1	2	3	4	5
$v(t)$ (ft/s)	0.00	28.64	49.64	64.91	76.36	84.00

average   acceleration   over   the   first   second   = \underline{\hspace{3cm}} (include **units**)

average   acceleration   over   the   second   second   = \underline{\hspace{3cm}} (include **units**)

Answer(s) submitted:

-
-

(incorrect)

5. (2 pts) Let $P(t)$ represent the price of a share of stock of a corporation at time t. What does each of the following statements tell us about the signs of the first and second derivatives of $P(t)$?

(a) The price of the stock is rising faster and faster.
The first derivative of $P(t)$ is $\boxed{?}$
The second derivative of $P(t)$ is $\boxed{?}$
(b) The price of the stock is just past where it maxed out.
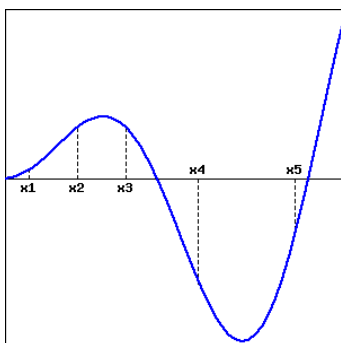The first derivative of $P(t)$ is $\boxed{?}$
The second derivative of $P(t)$ is $\boxed{?}$

Answer(s) submitted:

-
-
-
-

(incorrect)

---

6. (2 pts) Given the graph of $y = f(x)$ below, at which of the marked x-values can the following statements be true?

*(For each question, enter your answer as a comma-separated list, e.g., **x1,x3,x5**. Enter **none** if no points satisfy the given condition)*

A. $f(x) < 0$ at $x =$ _____

B. $f'(x) < 0$ at $x =$ _____

C. $f(x)$ is decreasing at $x =$ _____

D. $f'(x)$ is decreasing at $x =$ _____

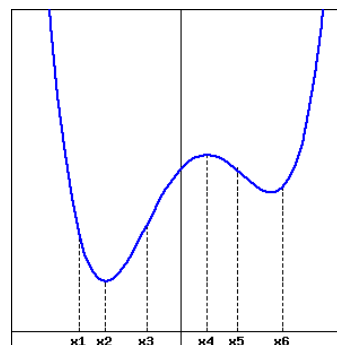**E.** The slope of $f(x)$ is positive at $x =$ _____

F. The slope of $f'(x)$ is positive at $x =$ _____

Answer(s) submitted:

-
-
-
-
-
-

(incorrect)

---

7. (2 pts) The graph of f' (**not** f) is given below.

(Note that this is a graph of f', not a graph of f.)

At which of the marked values of x is
A. $f(x)$ greatest? $x =$ _____
B. $f(x)$ least? $x =$ _____
C. $f'(x)$ greatest? $x =$ _____
D. $f'(x)$ least? $x =$ _____
E. $f''(x)$ greatest? $x =$ _____
F. $f''(x)$ least? $x =$ _____

Answer(s) submitted:

-
-
-
-
-
-

(incorrect)

---

8. (3 pts) A continuous function f, defined for all x, has the following properties:
1. f is decreasing
2. f is concave up
3. $f(13) = -4$
4. $f'(13) = -\frac{1}{3}$

Sketch a possible graph for f, and use it to answer the following questions about f.

A. For each of the following intervals, what is the minimum and maximum number of zeros f could have in the interval? *(Note that if there must be exactly N zeros in an interval, the minimum and maximum are both N.)*

	minimum	maximum
$-\infty < x \le 0$	___	___
$0 < x \le 1$	___	___
$1 < x < 13$	___	___
$13 \le x < \infty$	___	___

B. Are any of the following possible values for $f'(1)$? (Enter your answer as a comma-separated list, or enter 'none' if none of them are possible.) $-3, -2, -1, -\frac{1}{4}, 0, \frac{1}{4}, 1, 2, 3$.
possible values: $f'(1) =$ _____

2

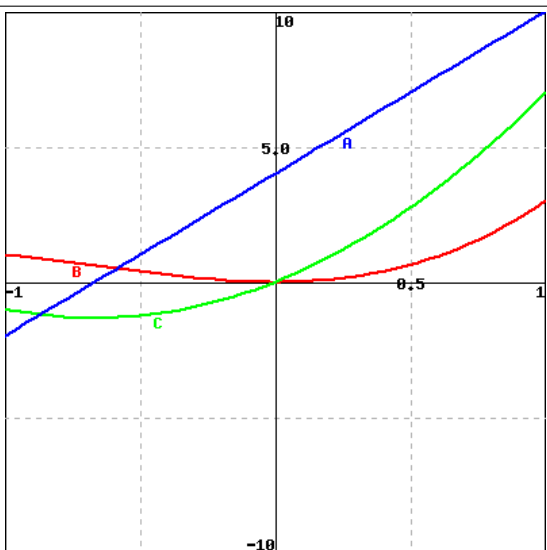**C.** What happens to f as $x \to -\infty$?

$\lim\limits_{x \to -\infty} f(x) =$ _____

(Enter the value, 'infinity' or '-infinity' for ∞ or $-\infty$, or 'none' if there is no limit.)

Answer(s) submitted:

-
-
-
-
-
-
-
-
-
-

(incorrect)

9. (1 pt)

Identify the graphs A (blue), B(red) and C (green) as the graphs of a function and its derivatives:
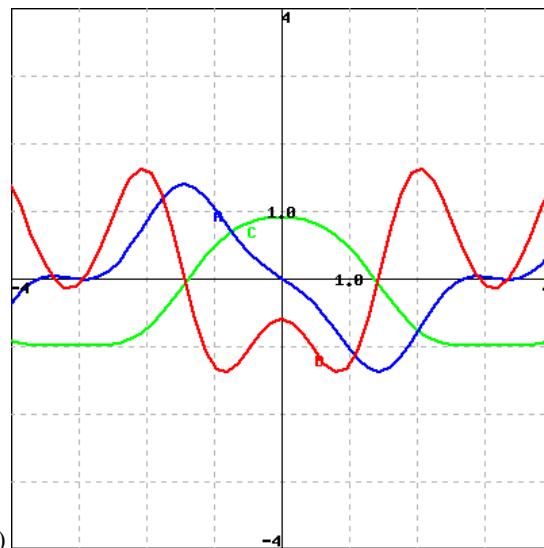
____ is the graph of the function
____ is the graph of the function's first derivative
____ is the graph of the function's second derivative

Answer(s) submitted:

-
-
-

(incorrect)

10. (1 pt)

Identify the graphs A (blue), B(red) and C (green) as the graphs of a function and its derivatives:

____ is the graph of the function
____ is the graph of the function's first derivative
____ is the graph of the function's second derivative

Answer(s) submitted:

-
-
-

(incorrect)