AP Calculus AB Fall Exam Review WS #5 Calculator portion Problems

1.

The first derivative of a function f is given by $f'(x) = \frac{\cos x(2x\sin x - \cos x)}{x^2}$. On the interval $0 < x < 8$, how many relative maxima does the function f have?

A. 0
B. 1
C. 2
D. 3
E. 4

2.

Let f and g be differentiable functions on the interval $(3,\infty)$ such that $g'(x) = f(x)\ln(x-3)$, and $f(x) > 0$ for all $x > 3$. Which of the following must be true?

A. $g(x)$ has a relative minimum at $x = 4$.
B. $g(x)$ has a relative maximum at $x = 3$.
C. $g(x)$ has a relative minimum at $x = 4$ and a relative maximum at $x = 3$.
D. $g(x)$ has no relative minimum or maximum.
E. There is not enough information to determine the relative extrema of $g(x)$.

3.

Let f be a function that is differentiable on the open interval $(0,5)$. If $f(1) = 2$, $f(3) = -1$, and $f(4) = 5$, which of the following must be true?

I. For some value $1 < c < 4$, $f'(c) = 1$.

II. The function f has at least three zeros on the interval $(0,5)$.

III. For some value $1 < c < 4$, $f(c) = 4$.

A. I only
B. I and II
C. I and III
D. II and III
E. I, II and III

4.

If the base of a triangle is increasing at a rate of 2 centimeters per minute, and its area remains constant, at what rate is the height changing?

A. $b - 4h$
B. $-\frac{h}{4b}$
C. $-\frac{2h}{b}$
D. $\frac{4h}{b}$
E. $\frac{b}{4h}$

5.

If $c \neq 0$, then $\lim_{x \to c} \frac{x^3 - c^3}{x^2 - c^2}$ is

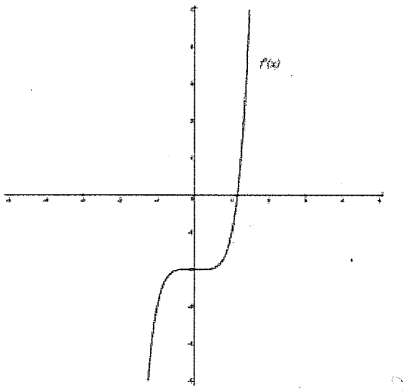
A. 0
B. $\frac{3c}{2}$
C. $2c$
D. $2c^2$
E. nonexistent

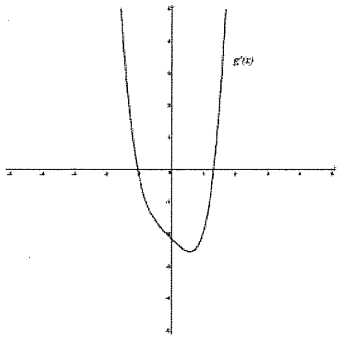
Hint: $(a^3 - b^3) = (a - b)(a^2 + ab + b^2)$

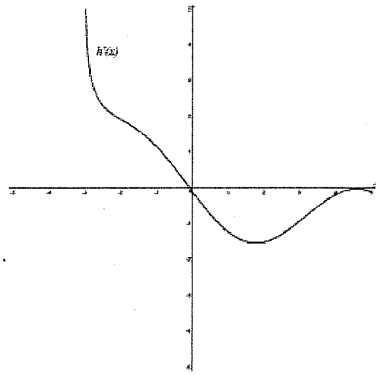
6.

The side of a square is increasing at a constant rate of 0.2 centimeters per second. In terms of the perimeter, P, of the square, what is the rate of change of the area of the square in square centimeters per second?

A. $0.8P$
B. $0.2P$
C. $0.1P$
D. $0.01P$
E. $0.04P$



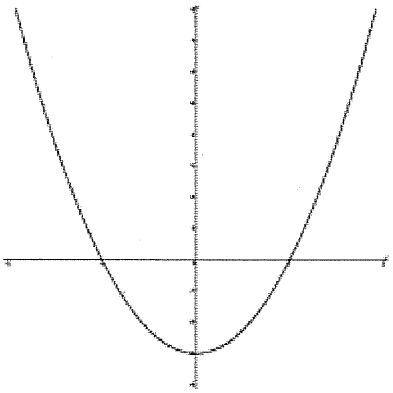




7. The graphs of the derivatives of functions f, g, and h are shown above. Which of the functions have a relative minimum on the interval $-3 < x < 3$?

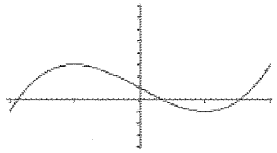
A. g only
B. h only
C. f and g
D. g and h
E. f and h

8.

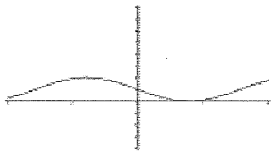


The graph of f', the derivative of f, is shown in the figure above. Which of the following could be the graph of f?

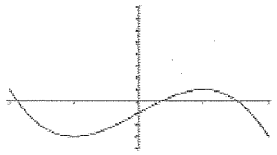
A.



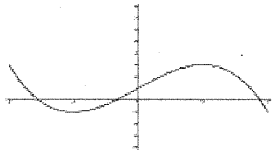
B.



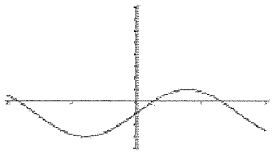
C.



D.



E.



9. The graph of a twice-differentiable function f is shown in the figure above. Which of the following is true?

A. $f'(0) > f''(0) > f(0)$
B. $f(0) > f'(0) > f''(0)$
C. $f(0) > f''(0) > f'(0)$
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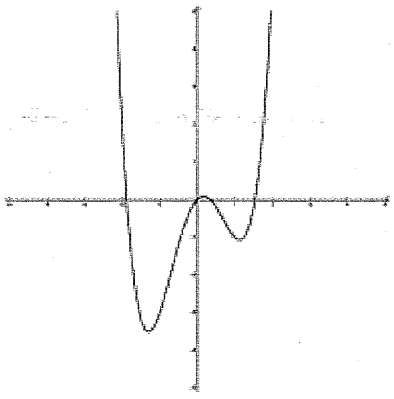

AP Calculus AB Fall Exam Review **WS #5** (calculator portion problems)

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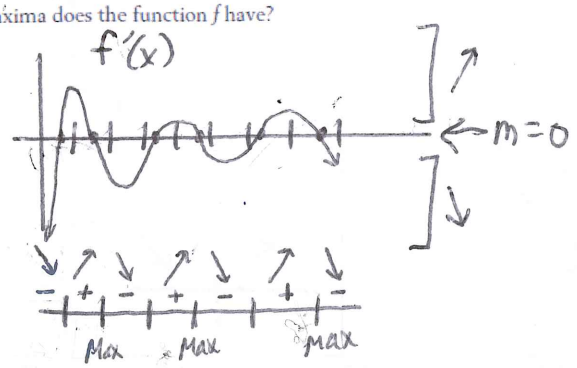
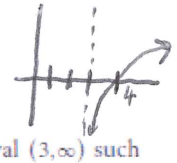


2.

$y = \ln(x-3) \rightarrow$ 

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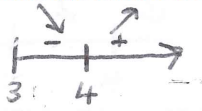
E. There is not enough information to determine the relative extrema of $g(x)$.

$g'(x) = f(x)\cdot\ln(x-3)$
$0 = f(x)$, $0 = \ln(x-3)$
$f(x) > 0$

$\ln(x-3) = 0$
$\log_e(x-3) = 0$
$e^0 = x-3$
$1+3 = x$



3.

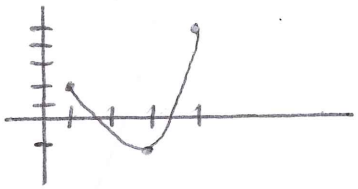
Let f be a function that is differentiable (smooth curve) on the open interval $(0,5)$. If $f(1) = 2$, $f(3) = -1$, and $f(4) = 5$, which of the following must be true?

I. For some value $1 < c < 4$, $f'(c) = 1$. True, MVT $\rightarrow \frac{f(4)-f(1)}{4-1} = \frac{5-2}{4-1} = \frac{3}{3} = 1$

II. The function f has at least three zeros on the interval $(0,5)$. not necessarily

III. For some value $1 < c < 4$, $f(c) = 4$. True, IVT

A. I only
B. I and II
C. I and III
D. II and III
E. I, II and III



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If the base of a triangle is increasing at a rate of 2 centimeters per minute, and its area remains constant, at what rate is the height changing?

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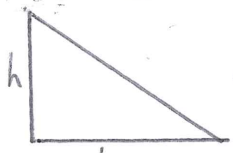

$\frac{db}{dt} = 2$ cm/min
$\frac{dA}{dt} = 0$ cm^2/min
Find $\frac{dh}{dt} =$ ____

$A = \frac{1}{2}bh$
*Apply product rule

$\frac{dA}{dt} = \frac{1}{2}\left(\frac{db}{dt}\right)h + \frac{1}{2}b\left(\frac{dh}{dt}\right)$
$0 = \frac{1}{2}(2)h + \frac{1}{2}b\left(\frac{dh}{dt}\right)$
$0 = h + \frac{b}{2}\left(\frac{dh}{dt}\right)$
$-h = \frac{b}{2}\left(\frac{dh}{dt}\right)$

$-h\cdot\frac{2}{b} = \frac{dh}{dt}$

$\frac{dh}{dt} = \frac{-2h}{b}$ cm/min

5.

If $c \neq 0$, then $\lim_{x\to c}\frac{x^3 - c^3}{x^2 - c^2}$ is

A. 0
B. $\frac{3c}{2}$
C. $2c$
D. $2c^2$
E. nonexistent

Hint: $(a^3 - b^3) = (a - b)(a^2 + ab + b^2)$

$\lim_{x\to c}\frac{(x-c)(x^2+xc+c^2)}{(x-c)(x+c)} = \frac{c^2+c^2+c^2}{c+c} = \frac{3c^2}{2c} = \frac{3c}{2}$

6.

The side of a square is increasing at a constant rate of 0.2 centimeters per second. In terms of the perimeter, P, of the square, what is the rate of change of the area of the square in square centimeters per second?

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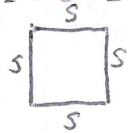
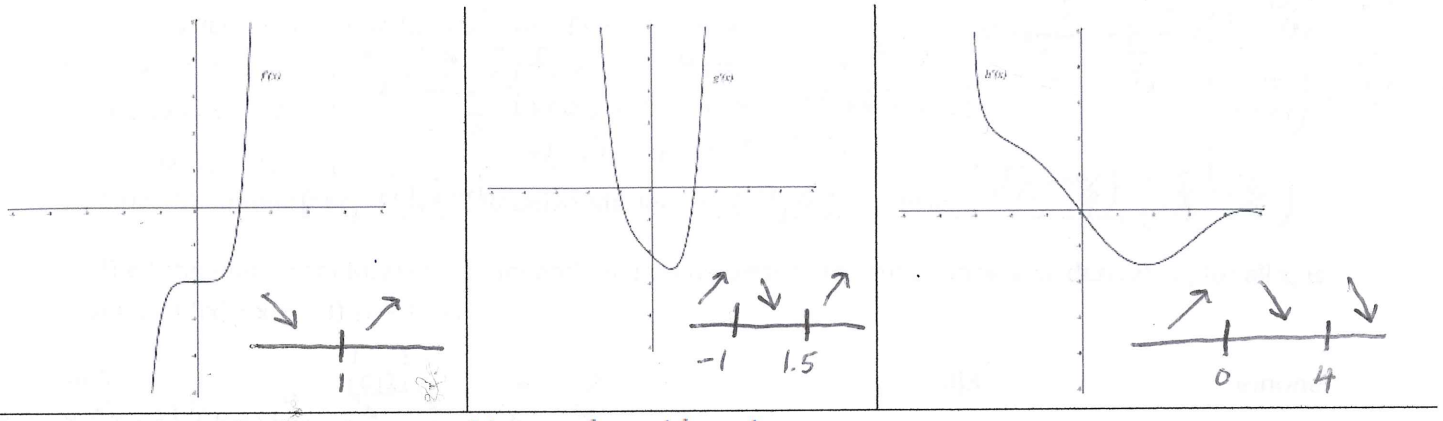


$\frac{ds}{dt} = 0.2$ cm/s
Find $\frac{dA}{dt} =$ ____

$A = s^2$
$P = 4s$
$\frac{P}{4} = s$

$\frac{dA}{dt} = 2s\left(\frac{ds}{dt}\right)$
$\frac{dA}{dt} = 2\left(\frac{P}{4}\right)(0.2) = \frac{0.2P}{2} = 0.1P$ cm^2/s



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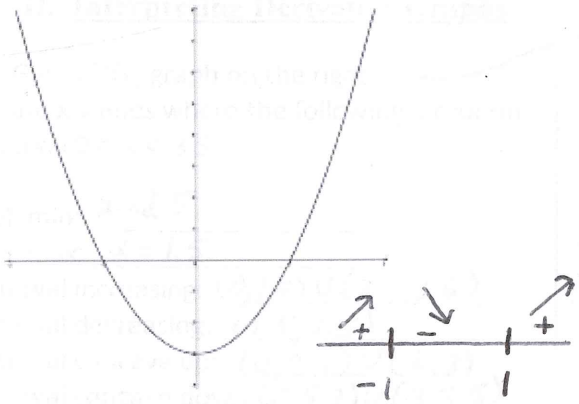

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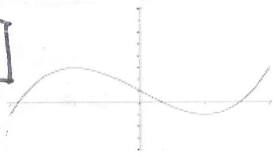

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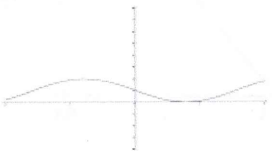
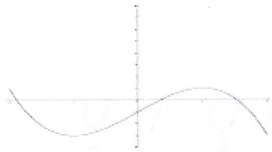
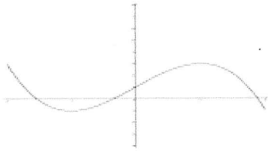
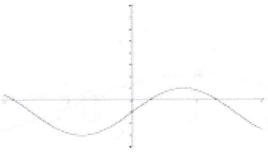


C.


D.


E.


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B. $f(0) > f'(0) > f''(0)$
C. $f(0) > f''(0) > f'(0)$
D. $f''(0) > f(0) > f'(0)$
E. $f'(0) > f(0) > f''(0)$

$f(0) = 0$
$f'(0)$ = positive value (positive slope)
$f''(0)$ = negative value (concave down)
$f'(0) > f(0) > f''(0)$