Math 141 **Exam 1** **10/17/2014**

Name: _____

Answer the questions on the exam and not on a separate sheet of paper. No work is necessary for the True/False questions or the multiple choice. For all other questions, please circle your answers and show your work for full credit. There are 10 questions for a total of 100 points.

True or False: Please circle either true or false. No work is necessary.

_____ 1. (5 points) There exists a function f such that $f(1) = -2$, $f(3) = 0$ and $f'(x) > 1$ for all x.

A. True B. False

_____ 2. (5 points) $\dfrac{d}{dx}(\ln 12) = \dfrac{1}{12}$.

A. True B. False

_____ 3. (5 points) If f and g are differentiable functions on the interval $[a, b]$, then $f+g$ is a continuous function on $[a, b]$.

A. True B. False

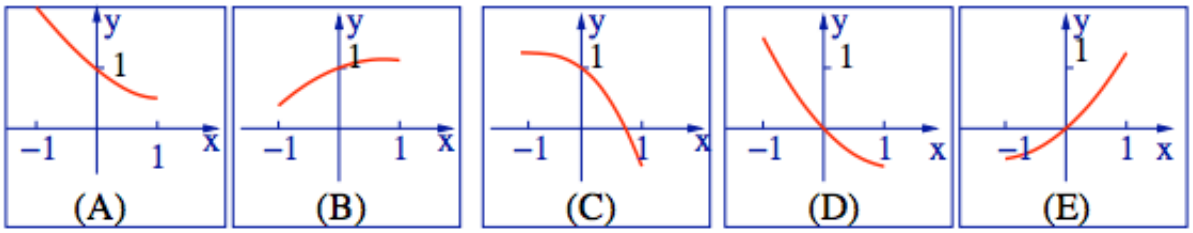
_____ 4. (5 points) If the limit of $f(x)$ as x approaches c is 0, then there must exist a number k such that $f(k) < 0.0001$.

A. True B. False

Let's look at $A \subsetneq B$.

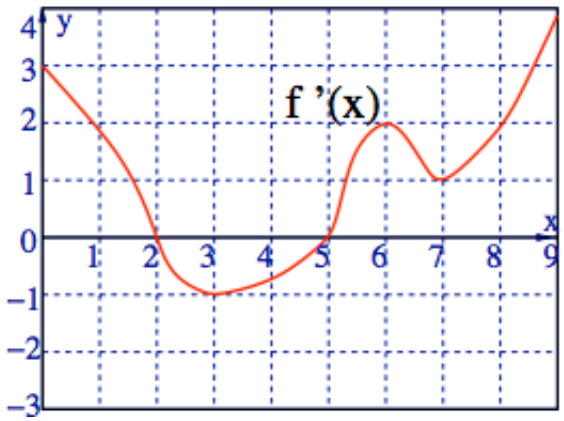
Multiple Choice: Please circle your answer. No work is necessary.

_____ 5. (5 points) Suppose that $f(x)$ is differentiable on the interval $[-1.1]$. If $f'(0) > 0$ and $f'(x)$ is decreasing on the interval $(-1, 1)$, circle one graph that best represents the curve of $f(x)$.



Short Answer.

6. The figure shows the graph of the derivative f' of the function f (for $0 \leqslant x \leqslant 9$). Use the graph to answer the questions below. **Be careful. This is the graph of the derivative of the function.**



(a) (5 points) On what interval(s) if $f(x)$ increasing? Explain your answer.

(b) (5 points) Which number is larger, $f(3)$ or $f(4)$? Explain your answer.

(c) (5 points) Which number is larger, $f''(3)$ or $f''(4)$? Explain your answer.

7. In this problem, the function $f(x)$ satisfies

$$f(1) = 2;\ f(2) = -1;\ f(3) = 5;\ f'(1) = -3;\ f'(2) = 3;\ f'(3) = -2;\ f'(4) = 2$$

(a) (7 points) Let $G(x) = x^2 f(x)$, find $G'(1)$.

(b) (8 points) Let $H(x) = f(x^2)$. Find the derivative of $H(x)$ at $x = 2$.

8. (15 points) At what point on the curve $y = [\ln(x+4)]^2$ is the tangent horizontal?

9. (15 points) Find the equation of the tangent line to the curve $y = \dfrac{e^x}{1+x^2}$ at the point $(1, e/2)$.

10. (15 points) Let $f(x) = \begin{cases} 2x+1 & \text{if } x \geqslant 1 \\ \beta x^2 - 2 & \text{if } x < 1 \end{cases}$. For which value of β will f be continuous at $x = 1$. Justify your answer.