Math 125 First Midterm

October 13, 2009

Name: _____   **ID:** _____   **Rec:** _____

Question:	1	2	3	4	5	6	7	8	Total
Points:	9	9	12	8	8	12	8	8	74
Score:									

There are 8 problems in this exam. Make sure that you have them all.

Do all of your work in this exam booklet, and cross out any work that the grader should ignore. You may use the backs of pages, but indicate what is where if you expect someone to look at it. **Books, calculators, extra papers, and discussions with friends are not permitted.** Telepathic communication with mathematically talented ducks is allowed, although you must also turn in the duck for grading along with your exam (geese and other fowl are not allowed).

Use non-erasable pen (not red) if you want to be able to contest the grading of any problems. Questions with erasures will not be regraded.

Leave all answers in exact form (that is, do *not* approximate π, square roots, and so on.)

You have 90 minutes to complete this exam.

1. Compute each of the following limits. If the limit is not a finite number, please distinguish between $+\infty$, $-\infty$, and a limit which does not exist (DNE). Justify your answer, at least a little bit.

3 points   (a) $\displaystyle\lim_{x\to 3} \frac{x^2-9}{6x(x-3)}$

3 points   (b) $\displaystyle\lim_{x\to\infty} 6\cos\left(\frac{\pi}{x}\right)$

3 points   (c) $\displaystyle\lim_{x\to 2} \frac{x^2}{(x-2)^2}$

2. More of the same: compute each of the following limits. If the limit is not a finite number, please distinguish between $+\infty$, $-\infty$, and a limit which does not exist (DNE). Justify your answer, at least a little bit.

3 points   (a) $\displaystyle \lim_{x \to \infty} \frac{x^2 - 1}{6x(x-1)}$

3 points   (b) $\displaystyle \lim_{h \to 3} \frac{(x+h)^2 - x^2}{h}$

3 points   (c) $\displaystyle \lim_{x \to -\infty} e^x \cos(x)$

3. Let $f(x) = 2x^3 - 5x + 2$.

3 points   (a) Find the slope of the secant line passing through the points on the curve $y = f(x)$ where $x = 0$ and $x = 1$.

3 points   (b) Find $f'(1)$.

3 points   (c) Write the equation of the tangent line to the graph of $y = f(x)$ when $x = 1$.

3 points   (d) At $x = 1$, is $f(x)$ concave up, concave down, or neither? Justify your answer fully.

8 points   4. For what values of x is the function $f(x) = \dfrac{e^x}{4 - e^{1/x}}$ continuous?

8 points   5. Write a limit that represents the slope of the graph

$$y = \begin{cases} |x|^x & x \neq 0 \\ 1 & x = 0 \end{cases}$$

at $x = 0$. You **do not need to evaluate the limit.**

6. At right is the graph of **the derivative** $f'(x)$ of a function $f(x)$. Use it to answer each of the following questions.
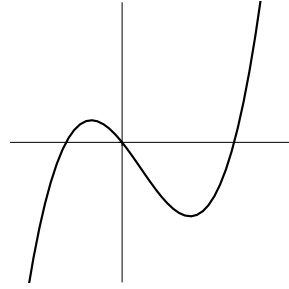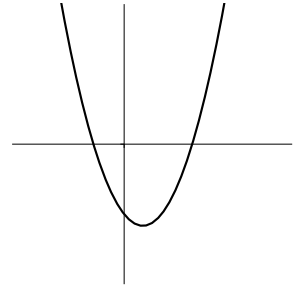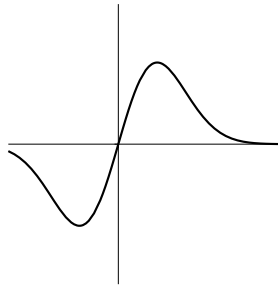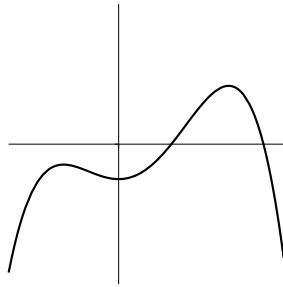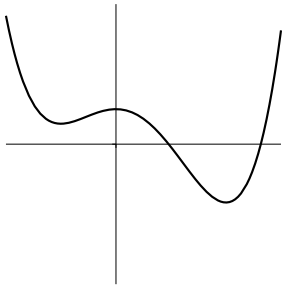

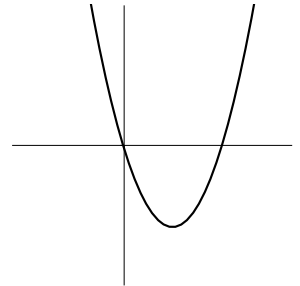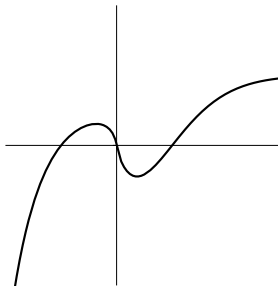4 points | (a) Is $f(x)$ concave up, concave down, or neither at $x = 0$?
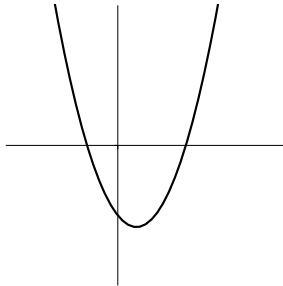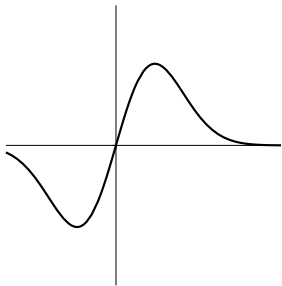
4 points | (b) Which of the following best represents the graph of $f(x)$? (circle your answer).

4 points | (c) Which of the following best represents the graph of $f''(x)$? (circle your answer).

7. Let $f(x) = \dfrac{x^2 - 4x}{2(x^2 - 16)}$

| 4 points | (a) Identify the horizontal asymptotes of $f(x)$. If there are none, write "NONE".

| 4 points | (b) Identify the vertical asymptotes of $f(x)$. If there are none, write "NONE".

| 8 points | 8. Write a function which expresses the area of a rectangle with a perimeter of 16 feet in terms of its width.