MAT 191 Test 2 October 9, 2012

Name: _____ Academic Integrity Signature: _____

I have abided by the UNCG Academic Integrity Policy.

Read all of the following information before starting the exam:

- It is to your advantage to answer ALL of the questions.
- It is your responsibility to make sure that you have all of the problems.
- There is no need to complete the test in order. The problems are independent.
- Duey has evil level 3, Pepsi has evil level 4, and Rusty has evil level 9.
- Correct numerical answers with insufficient justification may receive little or no credit.
- Clearly distinguish your final answer from your scratch work with a box or circle.
- *Budget your time!*
- If you have read all of these instructions, draw a happy face here.

Page:	1	2	3	4	5	6	Total
Points:	20	22	23	15	12	8	100
Score:							

1. (a) (5 points) If $f(x)$ is a function, give the definition of the *derivative of* $f(x)$.

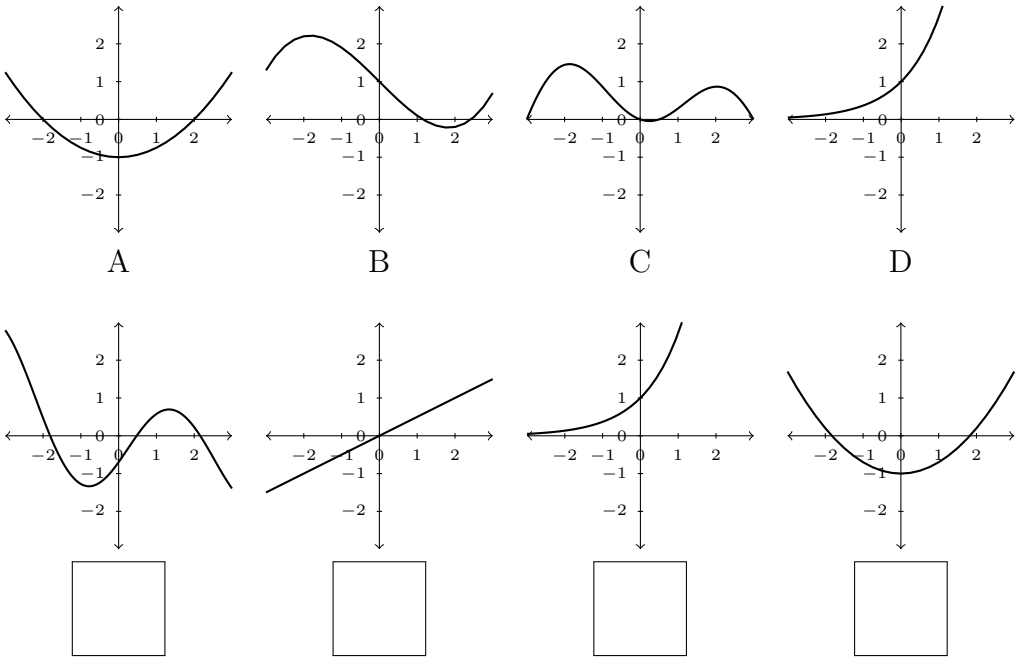
   (b) (5 points) Suppose $f(x) = \dfrac{1}{x}$. **Use the definition** to compute the derivative of $f(x)$.

2. (10 points) Find the value of a that makes the following function differentiable.

$$f(x) = \begin{cases} ax & \text{if } x < 0, \\ x^2 + 3x - 2 & \text{if } x \geq 0. \end{cases}$$

 Points earned: _____ out of 20.

3. (12 points) Match the functions graphed in the first row with their derivatives graphed in the second row.



4. (10 points) Find the derivative of $f(x) = \sec(x)$ using the definition of $\sec(x)$ in terms of $\cos(x)$. Simplify to show that $f'(x) = \sec(x)\tan(x)$.

5. Suppose the height of an object at t seconds is $s(t) = -t^2 + 2t + 8$ ft.

   (a) (3 points) What is the object's velocity? Give the units in which it is measured.

   (b) (3 points) What is the object's acceleration? Give the units in which it is measured.

   (c) (3 points) At what time does the object reach it's maximum height? Be sure to include the units.

   (d) (3 points) What is the object's maximum height? Be sure to include the units.

6. (11 points) Suppose $y^2 - y = x^3 - x$. Find $\frac{dy}{dx}$ when $(x, y) = (2, 3)$.

7. Suppose f and g are differentiable functions whose values are given below.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
1	3	2	$\sqrt{5}$	π
2	1	3	$\sqrt{7}$	e
3	2	1	$\sqrt{11}$	$\ln(7)$

(a) (5 points) If $h(x) = 7f(x) + 5g(x)$, what is $h'(2)$?

(b) (5 points) If $k(x) = \dfrac{f(x)}{g(x)}$, what is $k'(2)$?

(c) (5 points) If $r(x) = f(g(x))$, what is $r'(2)$?

 Points earned: _____ out of 15.

8. Find the derivatives of the following functions. Use the differentiation rules that apply. You do not have to further simplify the resulting derivative. [This problem continues on the next page.]

(a) (4 points) $f(x) = (2x - 7)^9$

(b) (4 points) $s(\theta) = \sin(2\theta)$

(c) (4 points) $h(t) = t^2 e^{\sin(t)}$

 Points earned: _____ out of 12.

(d) (4 points) $g(x) = \dfrac{1 + \sin(x)}{\cos(x)}$

(e) (4 points) $y(t) = \sqrt{t} + \dfrac{1}{2t} + \dfrac{1}{t^3} + \sqrt{3} + \pi^e$

 Points earned: _____ out of 8.