

# TEST 1

Math 105  
2/10/12

Name: \_\_\_\_\_

by writing my name I swear this work is my own

**Read all of the following information before starting the exam:**

- Show all work, clearly and in order, if you want to get full credit. I reserve the right to take off points if I cannot see how you arrived at your answer (even if your final answer is correct).
- Circle or otherwise indicate your final answers.
- Please keep your written answers brief; be clear and to the point. I will take points off for rambling and for incorrect or irrelevant statements. Put a smiley face next to your name for one point.
- This test has 6 problems and is worth 100 points, It is your responsibility to make sure that you have all of the pages!
- Good luck!

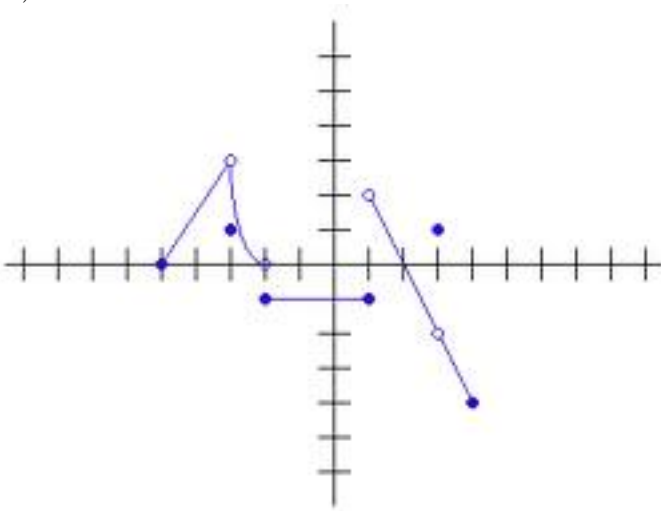
1. (10 points) The position of a car after time  $t$  is given by the table of values below.

|               |   |    |    |    |     |     |
|---------------|---|----|----|----|-----|-----|
| $t$ (seconds) | 0 | 1  | 2  | 3  | 4   | 5   |
| $s(t)$ (feet) | 0 | 15 | 46 | 72 | 118 | 195 |

- a. (3 pts) Find the average velocity for the time period beginning when  $t = 2$  and lasting 3 sec.
- b. (3 pts) Find the average velocity for the time period beginning when  $t = 2$  and lasting 1 sec.
- c. (4 pts) Estimate the instantaneous velocity when  $t = 2$ .

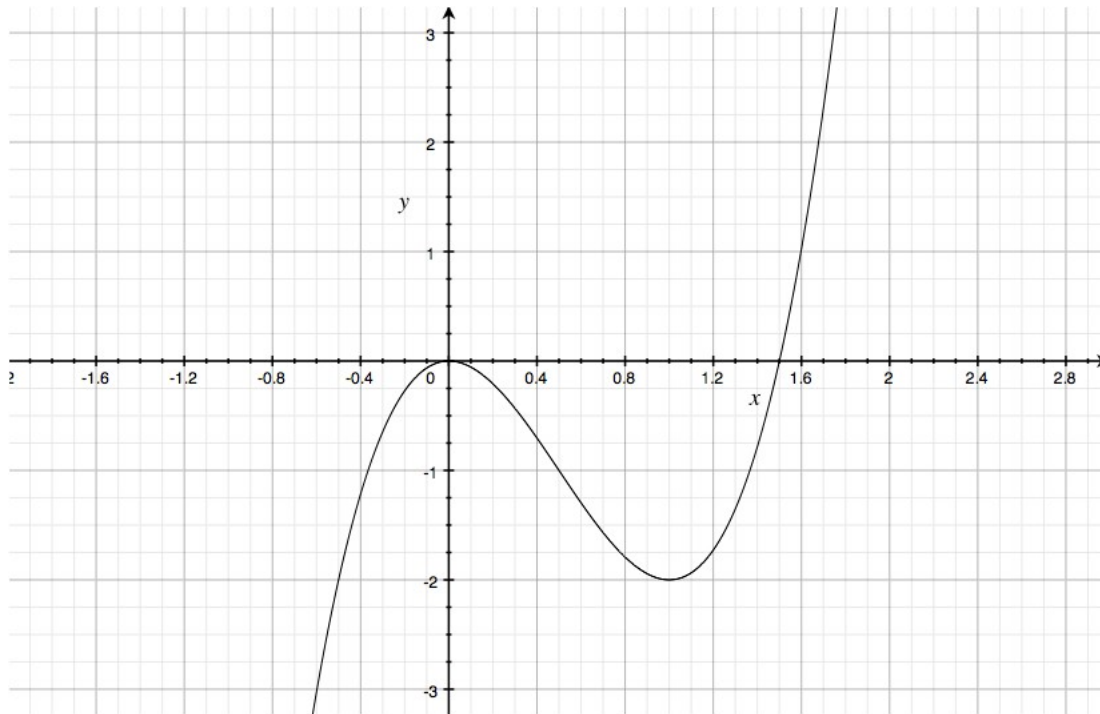
2. (10 points) Use the formal definition of the derivative (ie.  $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ ) to prove that  $\frac{d}{dx}(cg(x)) = c \frac{d}{dx}g(x)$  where  $c$  is a constant.

3. (19 points) The graph of  $f(x)$  is given. Solving the following (assume the tickmarks occur at 1, 2, etc).



- a. (3 pts)  $\lim_{x \rightarrow 1^-} f(x) =$
- b. (3 pts)  $\lim_{x \rightarrow 1^+} f(x) =$
- c. (3 pts)  $f(1) =$
- d. (3 pts)  $\lim_{x \rightarrow -2} f(x) =$
- e. (3 pts)  $\lim_{x \rightarrow -3} f(x) =$
- f. (4 pts) For what values of  $x$  is  $f(x)$  NOT continuous?

4. (34 points) The following is a graph of  $g'$ , NOT  $g$ .



- a. (2 pts) What is  $g'(0)$ ?
- b. (2 pts) What is  $g''(0)$ ?
- c. (4 pts) Draw and label the graph of the  $g''$  on the graph.
- d. (12 pts) On what intervals is  $g$  increasing? decreasing? concave up? concave down?
- e. (4 pts) Is  $x = 0$  a maximum, minimum, or neither of  $g$ ? How do you know?
- f. (4 pts) Is  $x = 1.5$  a maximum, minimum, or neither of  $g$ ? How do you know?
- g. (6 pts) Sketch and label **2** possible graphs of  $g$  on the graph above.

**5.** (12 points) Find the following limits. Use algebra when possible or necessary. If a limit doesn't exist then clearly explain why.

a. (4 pts)  $\lim_{x \rightarrow 1} \frac{7x-7}{3x^2-2}$

b. (4 pts)  $\lim_{x \rightarrow 0} \frac{\sqrt{25-x}-5}{x}$

c. (4 pts)  $\lim_{x \rightarrow 3} \frac{|x-3|}{x-3}$

**6.** (14 points)

a. (5 pts) Solve the differential equation  $y' = 4x^3 - \frac{6}{x^2} + 2\sqrt{x}$ .

b. (5 pts) What is  $y''$ ?

c. (4 pts) If you haven't done so already, write **a.** and **b.** without fractional or negative exponents.