

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

Math 105B: Fall 2012  
Exam 1: October 5

**Correct answers accompanied by incorrect or incomplete work will not receive full credit.**

1. (8 points) Let  $g(x) = b^x$  where  $b$  is a constant and  $0 < b < 1$ .

(a) What is the domain of  $g(x)$ ?

(b) Is 0 in the range of  $g(x)$ ? Justify your answer.

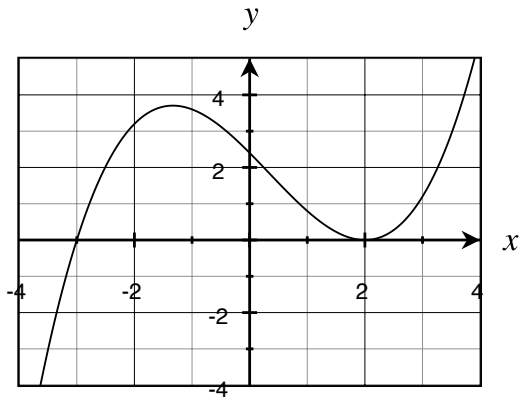
2. (4 points) Let  $T(t)$  be the temperature of an object (in degrees Celsius)  $t$  hours after noon. What does the statement  $T'(2.5) \approx -7$  mean in this context? Include units in your answer.

3. Suppose  $g(x) = 0.3f(x) - 2$ .

(a) (5 points) Describe how the graphs of  $g(x)$  and  $f(x)$  are related. (Use words like horizontal, vertical, compressed, shifted, stretched, translated, etc.)

(b) (4 points) Let  $f'(x) = \sqrt{x^2 + 3}$ . Evaluate  $g'(1)$ .

4. (5 points each) The graph below is a graph of  $y = g''(x)$ .



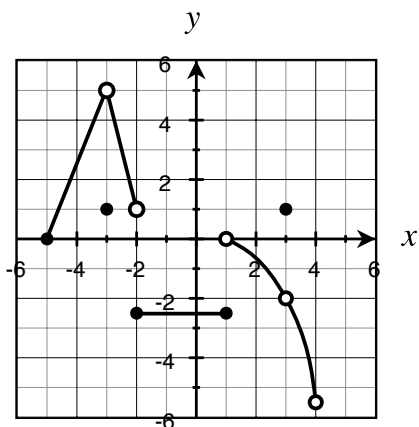
(a) Estimate  $g'''(0)$ .

(b) If possible, determine each of the following. Justify your answer.

i. The interval(s) for which  $g$  is decreasing.

ii. The interval(s) for which  $g$  is concave up.

5. (4 points each) The graph of  $f(x)$  is given. Solve the following (assume the tickmarks occur at 1, 2, etc).



(a)  $\lim_{x \rightarrow -2^-} f(x)$

(b)  $\lim_{x \rightarrow -2^+} f(x)$

(c)  $f(-2)$

(d)  $\lim_{x \rightarrow 1} f(x)$

(e)  $\lim_{x \rightarrow 3} f(x)$

- (f) For what value(s) of  $x$  is  $f(x)$  NOT continuous?

6. (6 points) Let  $f(x) = \sqrt{x+2}$ . Use the limit definition of derivative to compute  $f'(14)$ .

7. (6 points each) Let  $f(x) = 3x^2 + \frac{\pi}{x^2} - \sqrt{x} + 12$ .

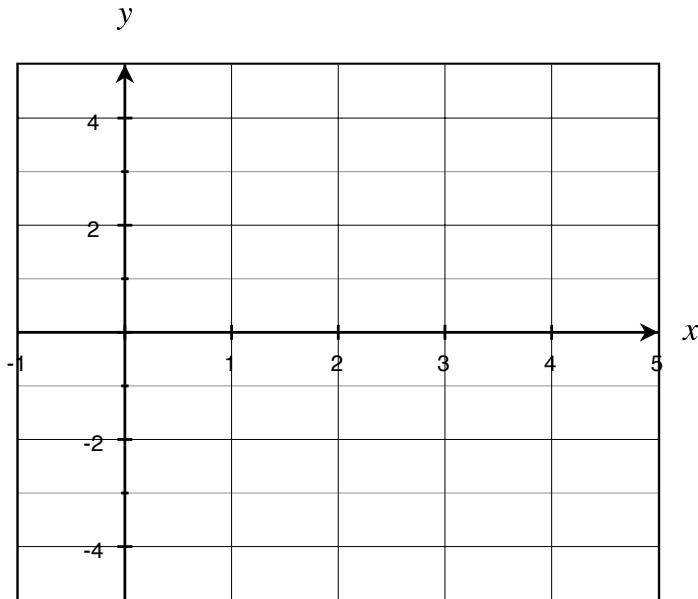
(a) Find the derivative of  $f$ .

(b) Find an antiderivative of  $f$ .

8. (5 points each) Let  $f(x)$  be a continuous function with the following properties:

- $f$  is positive on the interval  $(-\infty, 2)$  and negative on the interval  $(2, \infty)$ .
- $f'(x) < 0$  on the interval  $(-\infty, 3)$ ,  $f'(3) = 0$ , and  $f'(x) > 0$  on the interval  $(3, \infty)$ .
- $f''(x) > 0$  on the interval  $(-\infty, 4)$ ,  $f''(4) = 0$  and  $f''(x) < 0$  on the interval  $(4, \infty)$ .

(a) Sketch a possible graph of  $f(x)$ .



(b) Suppose  $F$  is an antiderivative of  $f$ . At which value(s) of  $x$  in the interval  $[0, 5]$  does  $F$  have a local minimum? Justify your answer.

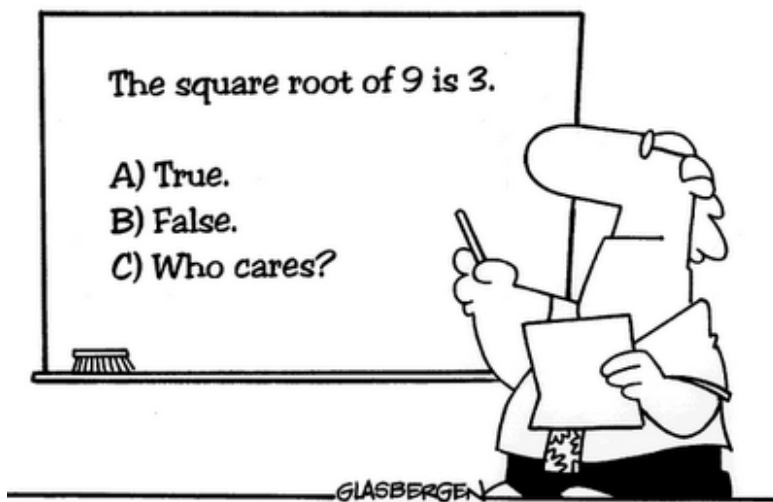
(c) Suppose  $F$  is an antiderivative of  $f$ . Does  $F$  have an inflection point? Justify your answer.

(d) Which value is larger:  $\frac{f(0) - f(-3)}{3}$  or  $f'(0)$ ? Justify your answer.

9. (2 points) Who do you think will win the World Series?

- Atlanta Braves
- Baltimore Orioles
- Cincinnati Reds
- Detroit Tigers
- New York Yankees
- Oakland Athletics
- San Francisco Giants
- St. Louis Cardinals
- Texas Rangers
- Washington Nationals

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