

Name: _____

Math 105A: 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.

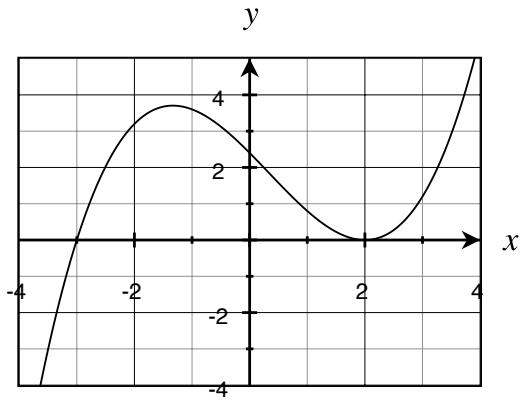
2. (4 points) Let $P(t)$ be the population of the US (in millions) t years after 1800. What does the statement $P'(10) \approx 2.3$ mean in this context? Include units in your answer.

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

(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 $f'(x) = (x^2 + 3)^{-1}$. Evaluate $g'(1)$.

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



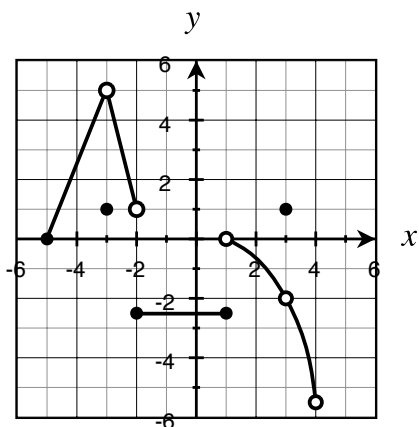
(a) Estimate $g'''(3)$.

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

i. The interval(s) for which g is increasing.

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) $\lim_{x \rightarrow 1^-} f(x)$

(b) $\lim_{x \rightarrow 1^+} f(x)$

(c) $f(1)$

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

(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 $f(x) = 3x^2 + \frac{\pi}{x^2} - \sqrt{x} + 12$.

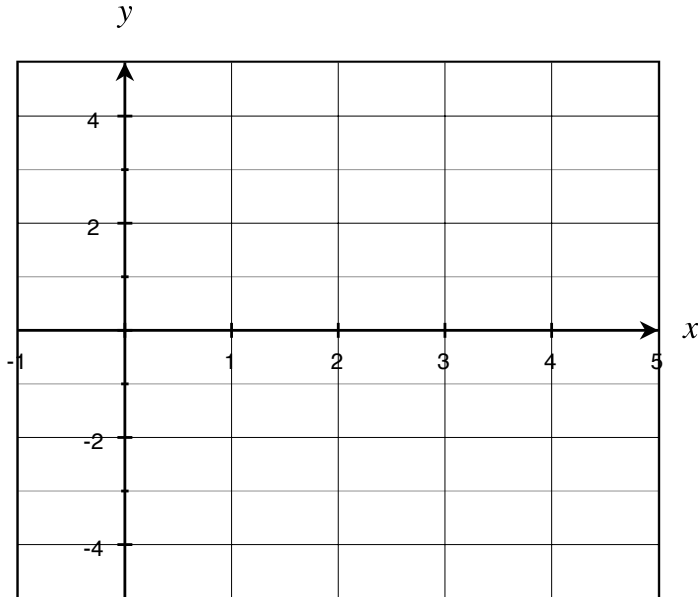
(a) Find the derivative of f .

(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 $(-\infty, 1)$ and negative on the interval $(1, \infty)$.
- $f'(x) < 0$ on the interval $(-\infty, 2)$, $f'(2) = 0$, and $f'(x) > 0$ on the interval $(2, \infty)$.
- $f''(x) > 0$ on the interval $(-\infty, 3)$, $f''(3) = 0$ and $f''(x) < 0$ on the interval $(3, \infty)$.

(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.

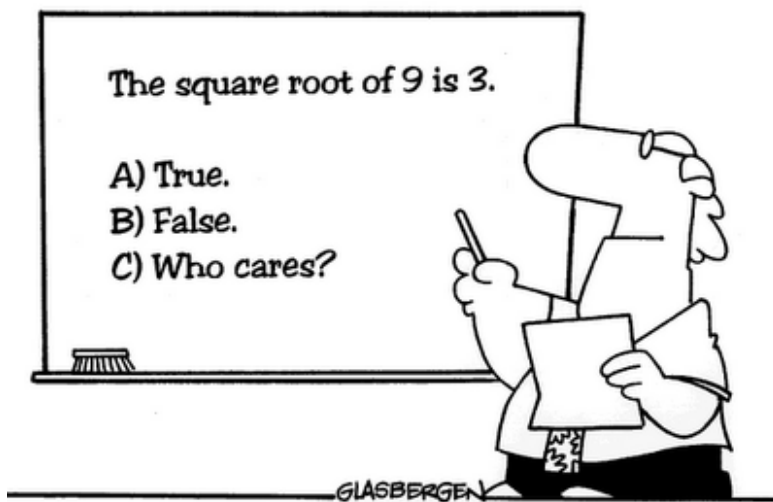
(c) Suppose F is an antiderivative of f . Does F have an inflection point? Justify your answer.

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

9. (2 points each) 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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