Math 180 **Name (Print):** _____
Spring 2014
Exam 2
April 4, 2014
Time Limit: 50 Minutes

This exam contains 5 pages (including this cover page) and 5 problems.

RULES:

- **No electronic devices** may be used during the exam (including calculators and cell phones).
- **No books, notes, or other reference materials** may be used during the exam.
- Violating any of these rules will result in expulsion from the exam and a score of zero.

INSTRUCTIONS:

- Write your answers directly on the exam pages.
- Use the back of a page if you need more space.
- **Show your work** and **justify your answers**.
  (Mysterious or unsupported answers will receive little or no credit.)

Problem	Points	Score
1	20	
2	20	
3	20	
4	20	
5	20	
Total:	100	

1. (20 points) Find the derivatives of the following functions. Do not simplify your answer once you find the derivative.

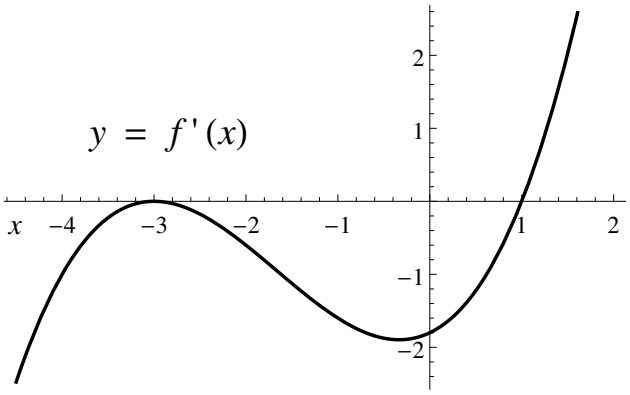
   (a) (6 points) $\dfrac{\log_{10} x}{10^x}$

   (b) (6 points) $\cos^{-1}(5x)$

   (c) (8 points) $\cos(x^{\cos x})$

2. (20 points) If two positive real numbers, x and y, have a product of 15, find the minimum value of $3x + 5y$. Is there a maximum value of $3x + 5y$? Explain.

3. (20 points) Suppose f is a function whose *derivative* has the graph shown below.



(a) (7 points) Determine the critical points of f.

(b) (7 points) Determine the intervals where f is increasing and the intervals where f is decreasing.

(c) (6 points) Classify each critical point as a local maximum, local minimum, or neither.

4. (20 points) Let $g(x) = 9x^{1/3} + 4$.

   (a) (7 points) Calculate the second derivative $g''(x)$.

   (b) (7 points) Find the intervals where g is concave up and those where g is concave down.

   (c) (6 points) Locate any inflection points of g. Justify your answer.

5. (20 points) (a) (15 points) Use linear approximation to estimate $\sqrt[3]{7.95}$.

(b) (5 points) Is your estimate from part (a) larger or smaller than the actual value of $\sqrt[3]{7.95}$? Justify your answer.