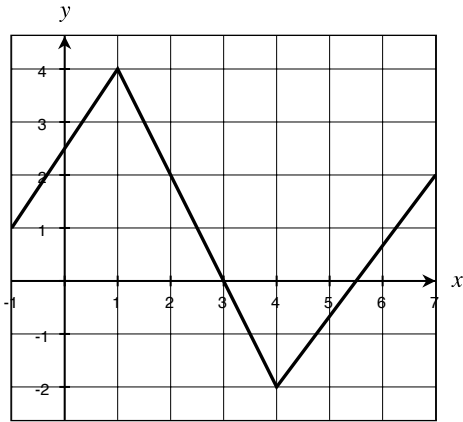


Name: _____

Math 105: Fall 2013
Exam 2: November 8

Correct answers accompanied by incorrect or incomplete work will not receive full credit.
There is a unit circle on the last page of the exam.

1. (14 points) Consider a function f that has the following graph.



Let $h(x) = \frac{f(x)}{2^x}$.

- (a) Write an expression for $h'(x)$.

- (b) Write an equation of the line tangent to h at $x = 3$.

2. (12 points) Consider a function g that has the following values and whose derivative has the following values:

x	$g(x)$	$g'(x)$
$-\pi/3$	1	-1
$-\pi/6$	2	-2
0	3	-3
$\pi/6$	4	-4
$\pi/3$	5	-5
$5\pi/3$	6	-6
$11\pi/6$	7	-7

Let $m(x) = g(\arctan x)$.

- (a) Write an expression for $m'(x)$.

- (b) Find $m'(-\sqrt{3})$.

3. (20 points) Find y' in **2 of 3** of the following. If you do more than two, then clearly mark which two you want graded. If you don't, the **worst** two will be chosen for you.

(a) $y = e^{\arcsin x} + (4x^2 + 6x^3) \cos x$

(b) $y = \sin^{11}(x^3) + 14 \ln(27x^2 + 5x)$

(c) $y = \sqrt[3]{\frac{14}{x}} + e^x \sin x$

4. (10 points) Find $\frac{dy}{dx}$ in **1 of 2** of the following. If you do more than one, then clearly mark which one you want graded. If you don't, the **worst** will be chosen for you.

(a) $y = \frac{(\cos^2 x)(x^3 - 7x)(e^{3x^4})}{(2^x)}$

(b) $y^3 + x \sin y = 15x$

5. (8 points) Is $y = 2x^5$ a solution to the Initial Value Problem

$$y' = \frac{5y}{x}, \quad y(1) = 2?$$

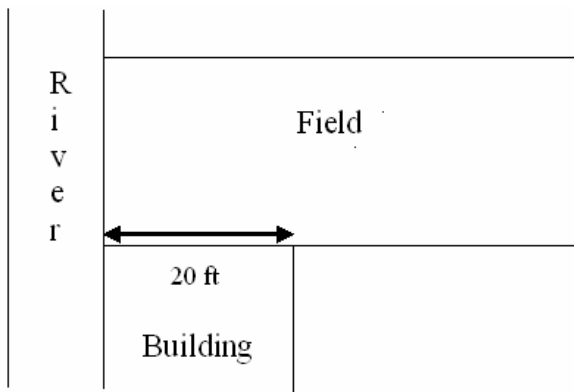
Justify your answer.

6. (15 points) Let f be a function with first and second derivatives given below:

$$f'(x) = \frac{1 - \ln x}{x - 4}, \quad f''(x) = \frac{-2 + \frac{4}{x} + \ln x}{(x - 4)^2}$$

Find the *critical points* of f on the interval $(0, \infty)$. Give the x -values exactly, *not* as decimal approximations. Classify each critical point as a local maximum, local minimum, or neither.

7. (20 points) A rectangular field as shown is to be bounded by a fence. Find the dimensions of the field with maximum area that can be enclosed with 1000 feet of fencing. You can assume that fencing is not needed along the river and building. (Be sure to show how you know you have found the maximum.)



8. (1 point) What is your favorite food?

