Math 180   **Name (Print):** _____

Spring 2014

Exam 1

February 21, 2014

Time Limit: 50 Minutes

This exam contains 5 pages (including this cover page) and 8 problems. Check to see if any pages are missing. Enter all requested information on the top of this page.

The following rules apply:

- **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.

Also note that **mysterious or unsupported answers will not receive full credit**. A correct answer, unsupported by calculations, explanation, or algebraic work will receive little to no credit; an incorrect answer supported by substantially correct calculations and explanations may receive partial credit.

Problem	Points	Score
1	10	
2	10	
3	10	
4	10	
5	15	
6	15	
7	15	
8	15	
Total:	100	

1. (10 points) Find $\lim\limits_{\theta \to 0} \dfrac{\tan \theta}{\theta}$.   [Hint: Rewrite $\tan \theta$ as $\dfrac{\sin \theta}{\cos \theta}$.]

2. (10 points) Use the Squeeze Theorem to find $\lim\limits_{x \to 0} x^2 \cos \left(\dfrac{1}{x^3} \right)$.

3. (10 points) Find all horizontal and vertical asymptotes of $f(x) = \dfrac{x^2 + 3x - 4}{x^2 - 2x + 1}$.
   Justify your answers using calculus.

4. (10 points) Calculate the derivative of $\dfrac{e^{-3x}}{5 - x^2}$. Do not simplify your answer.

5. (15 points) Calculate the derivative of $e^{3t}\sqrt{\cot(2t)}$. Do not simplify your answer.

6. (15 points)　(a) (5 points) Write the definition of the derivative of $f(x)$ as the limit of a difference quotient.

(b) (10 points) **Using the definition in part (a)**, find $f'(x)$ if $f(x) = \sqrt{x+1}$.

7. (15 points) The following picture shows graphs of two functions, y_1 (the solid curve) and y_2 (the dashed curve). One of the functions is the derivative of the other. Determine which function is the derivative of the other and give three examples/reasons why your choice is correct.
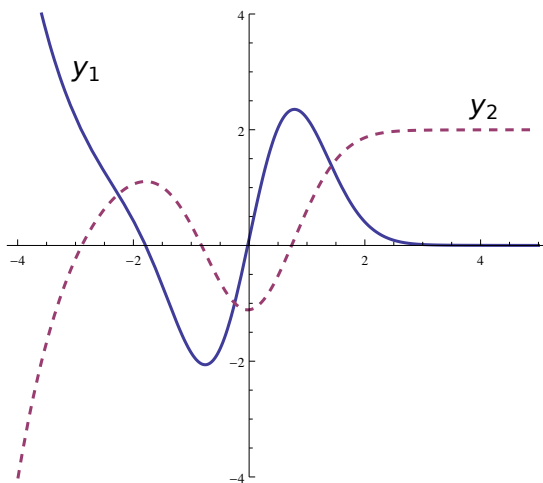
8. (15 points) On the axes provided, sketch a graph of a single function f that has all of the properties listed below.

$f(-1) = 2$	$f'(-1)$ does not exist
$\lim\limits_{x \to 2^-} f(x) = +\infty$	$\lim\limits_{x \to 2^+} f(x) = +\infty$
$\lim\limits_{x \to -\infty} f(x) = 0$	$\lim\limits_{x \to +\infty} f(x) = 1$