

MATH 2250

Midterm Exam I

September 26, 2013

NAME (please print legibly): _____

Your University ID Number: _____

Please complete all questions in the space provided. You may use the backs of the pages for extra space, or ask me for more paper if needed. This exam will be graded on:

- Correctness of computations.
- Clarity of explanation of procedure.
- Correctness of procedure.

A correct answer obtained using an incorrect or poorly explained procedure will not be graded for full credit. Please feel free to write as much as you like. Work carefully, and try to complete the problems you find easier before going back to the harder ones. Good luck!

QUESTION	VALUE	SCORE
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
TOTAL	80	

1. (10 points) Use the *definition of the derivative as a limit* to compute the derivative of

$$f(x) = \frac{1-x}{2x}.$$

You should use the ordinary derivative rules to check your answer, but you have to do the limit to get credit for the problem.

ANSWER: _____

2. (10 points) Find the derivative

$$\frac{d}{dx} \frac{x^2 + 3e^x}{2e^x - x}$$

using any method.

ANSWER: _____

3. (10 points) The position (in cm) of the print head on a 3d printer is given by

$$p(t) = \tan t + t^3.$$

where time is measured in seconds. Find the velocity of the print head at time 1. You do not need to give a decimal approximation for the velocity, but you *need to include units*.

ANSWER: _____

4. (10 points) Find the derivative of

$$\frac{d}{dx} \frac{f(x)}{g(x) + 1}.$$

Your answer should be in terms of $f(x)$, $g(x)$, $f'(x)$ and $g'(x)$.

ANSWER: _____

5. (10 points) Find the equation for the tangent line to the curve described by the implicit equation

$$2xy + \pi \sin y = 2\pi$$

at $(1, \pi/2)$.

ANSWER: _____

6. (10 points) Find the *second* derivative of

$$f(x) = \sec(x).$$

ANSWER: _____

7. (10 points) Use logarithmic differentiation to find the derivative $\frac{dy}{dx}$ given

$$y = \frac{1}{x(x+1)(x+2)}.$$

If you don't remember how to use logarithmic differentiation, you can complete the problem using the quotient rule for half credit.

ANSWER: _____

8. (10 points) (Continuity) Part 1. State the definition of continuity (yes, this is an Anki card):

A function $f(x)$ is continuous at the point $x = c$ if ...

ANSWER: _____

Part 2. A function is defined by

$$f(x) = \begin{cases} \frac{x+3}{x^2+4x+3}, & \text{if } x \text{ is not } -3 \\ 2, & \text{if } x = -3. \end{cases}$$

Use the definition above to decide whether $f(x)$ is continuous at $x = -3$.

ANSWER: _____