MATH 100 – PRACTICE EXAM 2

Name:_____

Lecture: MWF 12   MWF 1   MWF 3

Recitation: T. Crawford Th 11   T. Crawford Th 1   T. Crawford Th 2

                          G. Chiloyan Th 3   G. Chiloyan Th 11   G. Chiloyan Th 12

> FOR FULL CREDIT, SHOW ALL WORK
> NO CALCULATORS

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1. (a) **Using the limit definition of the derivative**, compute the derivative of $f(x) = \dfrac{1}{\sqrt{x}}$. (9 points)

(b) Did you get the right answer in part (a)? How do you know? (2 points)

2. Explain why there is a solution to the equation $e^x = x^2 - x^3$. *You must have at least one complete sentence in your answer for full credit.* (10 points)

3. (a) Find the equation of a general tangent line to the graph of $y = x^2 + 2$. (Hint: pick a general point x_0, and find the equation of the tangent line to $(x_0, f(x_0))$ in terms of x_0, x and y.) (7 points)

(b) Two different lines tangent to $y = x^2 + 2$ go through the point $(0,1)$. Find the equations of both of those lines AND the points where these lines are tangent to the parabola. (3 points)

4. In terms of $g(x)$ and $g'(x)$, find the derivative of $y = \dfrac{1}{\sin(g(x))}$. (10 points)

5. (a) Find $f'(x)$, $f''(x)$, and $f'''(x)$ for the function $f(x) = xe^{-x}$. (5 points)

(b) Give a general formula for $f^{(n)}(x)$. You don't need to prove your formula, but your answer should be in terms of x and n. (5 points)
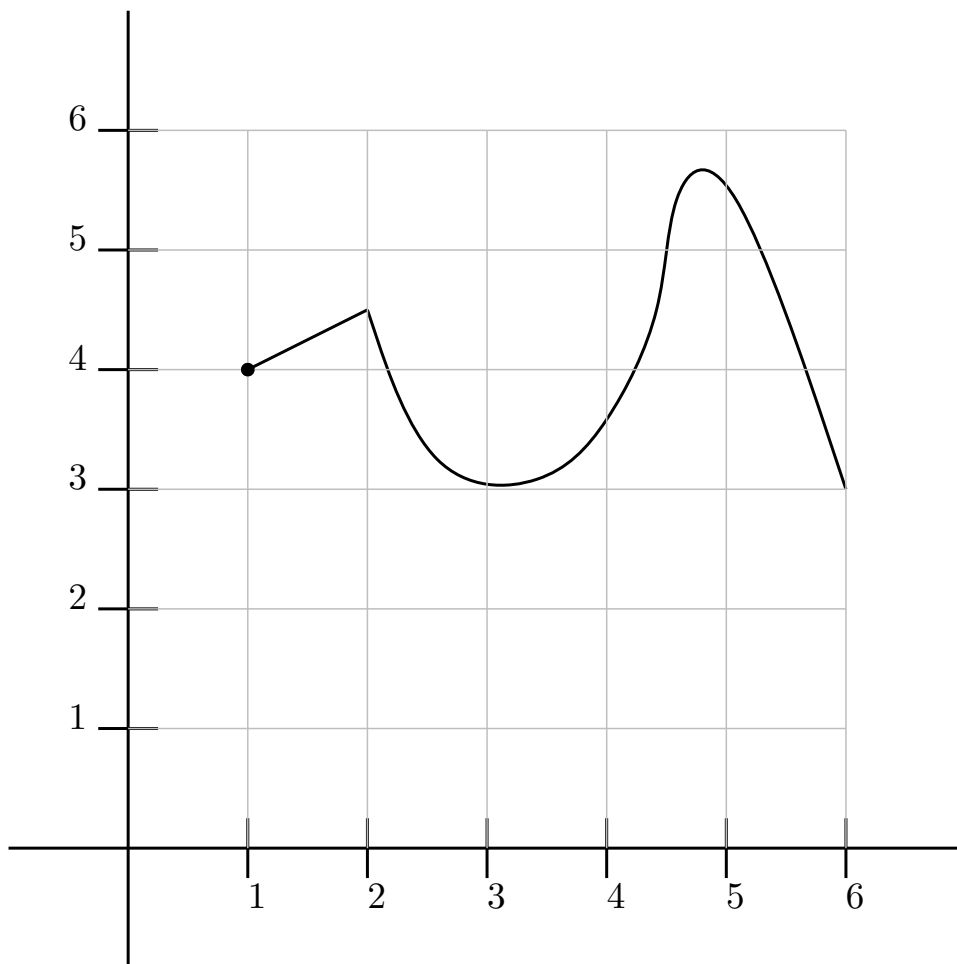
6. Compute the following derivatives, showing all steps. You do not need to use the limit definition of the derivative or state which rules you are using. (3 points each)

(a) $y = \dfrac{e^x - e^{-x}}{e^x + e^{-x}}$

(b) $y = x^{2^x}$ (Hint: Rewrite this function as a power of e.)

(c) $y = \sqrt{1 + \sin x \cos x}$

7. Below is the portion of the graph of a function $f(x)$. (It is the portion where $1 \leq x \leq 6$.) Use this graph to answer the following questions.

(a) If $f(x)$ is defined by $f(x) = 6 - cx^2$ for $0 \leq x < 1$, what value of c will make f continuous?   (5 points)

(b) For what values of x is $f'(x) = 0$?   (3 points)

(c) For what value of x does $f'(x)$ take its maximum value on the range $0 < x < 6$?   (2 points)

(d) Name all values of x in the range $0 < x < 6$ where the derivative does not exist.   (5 points)