MATH 125 Second Midterm

March 31, 2015

Name: ______________________ **ID:** __________________ **Rec:** ____

Question:	1	2	3	4	5	6	7	Total
Points:	16	12	10	10	10	10	10	78
Score:								

There are 7 problems in this exam. Make sure that you have them all.

Do all of your work in this exam booklet, and cross out any work that the grader should ignore. You may use the backs of pages, but indicate what is where if you expect someone to look at it. **Books, calculators, extra papers, and discussions with friends are not permitted.** If you brought a duck with you to the exam, you may consult with it on any mathematical questions you may have. (Why a duck? Why a-no chicken?)

Points will be taken off for writing mathematically false statements, even if the rest of the problem is correct.

Use non-erasable pen (not red) if you want to be able to contest the grading of any problems. Questions with erasures will not be regraded.

Leave all answers in exact form (that is, do *not* approximate π, square roots, and so on.)

You have 90 minutes to complete this exam.

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1. Compute each of the derivatives below as indicated.

4 points (a) $f(x) = 6x^8 - 5x^4 + 4x - e^3$.

4 points (b) $f(x) = e^{2x} \tan x$

4 points (c) $f(x) = \dfrac{3x^3 - 5x}{\sec(\pi x) + x^2}$

4 points (d) $f(x) = \arcsin(e^x)$

2. Calculate the indicated derivatives.

$\boxed{\text{4 points}}$ (a) $\dfrac{d}{d\theta}\sin(2\theta)\cos(3\theta)$

$\boxed{\text{4 points}}$ (b) Calculate the second derivative of x^2e^{2x} with respect to x.

$\boxed{\text{4 points}}$ (c) $\dfrac{d^{10}}{dt^{10}}11t^9$.

3. Let $f(x) = x\ln(x^4)$.

5 points (a) Calculate $f'(x)$.

5 points (b) For what values of x is $f(x)$ decreasing? If there are none, write "NONE"; otherwise, describe *all* such x. Give an exact answer (that is, do not approximate square roots, e, π, etc.) and justify your answer.

$\boxed{\text{10 points}}$ 4. Find the slope of the line tangent to the curve $\sin(xy) = x^2 + y^2 - \pi$ at the point $(0, \sqrt{\pi})$.

10 points

5. Jimi Chiu makes "designer" shoes[1] that he sells at \$250 a pair. He knows that the number of pairs of shoes he sells is a function of the price he charges; let's denote this by $N(p)$, where p is the price per pair. Market research tells him that $N'(250)$ is about -20; that is, if he raises the price by one dollar, he should expect to sell 20 fewer pairs. The amount of revenue $R(p)$ he makes at a given price will be given by $R(p) = p \cdot N(p)$.

   If he typically sells 2000 pairs of shoes at \$250 each, what is $R'(250)$? Should he raise the price a little?

[1] No relation to Jimmy Choo shoes, unless you don't look very closely. Mr. Chiu is also fond of Rollexx watches.

10 points

6. Let $f(x) = 4x^3 - x + 1$. Find the equation of a line which passes through the origin and is also tangent to the curve $y = f(x)$ at some point (a, b)

$\boxed{\text{10 points}}$ 7. Suppose $y = (1+\cos(x))^{(1+\sin(x))}$. What is $\dfrac{dy}{dx}$ when $x = \pi/2$ and $y = 1$?