MAT 125 Second Midterm

November 16, 2009

Name: ________________________ **ID:** ____________________ **Rec:** _____

Question:	1	2	3	4	5	6	Total
Points:	16	16	15	14	12	12	85
Score:							

There are 6 problems in this exam, printed on 6 pages (not including this cover sheet). 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 **clearly** what is where if you expect someone to look at it. **Books, calculators, extra papers, and discussions with friends are not permitted.** You may use a duck as an abacus (albeit a bizzare one), although please make sure it doesn't quack too much and disturb your neighbors.

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. For each of the functions $f(x)$ given below, find $f'(x)$).

4 points (a) $f(x) = \dfrac{1+2x^2}{1+x^4}$

4 points (b) $f(x) = \sin(2x)\cos(x)$

4 points (c) $f(x) = \arctan\left(\sqrt{1+3x}\right)$

this question uses material that won't be on our exam, but will be on the final.

4 points (d) $f(x) = \ln(\tan(x))$

2. Compute each of the following derivatives as indicated:

4 points (a) $\dfrac{d}{dt}\left[\, e^{\sin^2(t)} \,\right]$

4 points (b) $\dfrac{d}{du}\left[\, u^5 \ln(\sin(u)) \,\right]$

4 points (c) $\dfrac{d}{dz}\left[\, \sqrt{1+\sqrt{1+z}} \,\right]$

4 points (d) $\dfrac{d}{dx}\left[\, e^x - \pi^2 \,\right]$

3. The curve $x^2 - xy + y^2 = 16$ is an ellipse centered at the origin.

4 points (a) Find the points where this ellipse intersects the x-axis.

6 points (b) Find the slope of the tangent line to this ellipse at each of the points from part (a).

5 points (c) Locate all points on this ellipse where the line tangent to the curve is horizontal.

4. Let $f(x) = x\ln(2x)$

$\boxed{\text{4 points}}$ (a) Calculate $f'(x)$

$\boxed{\text{4 points}}$ (b) Calculate $f''(x)$

$\boxed{\text{3 points}}$ (c) For what values of x is $f(x)$ increasing?

$\boxed{\text{3 points}}$ (d) For what values of x is $f(x)$ concave down?

12 points

5. The volume V of a spherical ball is growing at a constant rate of $1\ m^3/min$. Determine the rate of increase of its surface area S (in m^2/min) when its radius r is equal to 1 meter.

   Perhaps you might find it helpful to recall that the volume of a sphere of radius r is given by $V = \frac{4}{3}\pi r^3$, and its surface area is $S = 4\pi r^2$.

This problem uses material we have not yet covere, and so won't be on the midterm.

12 points 6. Use a linear approximation to estimate the value of $\arcsin(.52)$

This problem uses material that won't be on our midterm (but will be on the final).