

Math 125

Second Midterm (modified)

March 20, 2007

Name: _____ ID: _____ Rec: _____

Question:	1	2	3	4	5	6	7	8	Total
Points:	16	12	14	10	10	13	10	14	99
Score:									

There are 8 problems in this exam, printed on 7 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.**

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 $f'(x)$.

(a) 4 points $f(x) = x^5 + 5x^4 + 4x^2 + 9$

(b) 4 points $f(x) = x^8 e^{2x}$

(c) 4 points $f(x) = \frac{3x^2 + 9}{x^3 + 2 \tan x}$

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

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2. Compute each of the following derivatives as indicated:

(a) 4 points $\frac{d}{d\theta} \left[\cos \left(\frac{\pi}{180} \theta \right) \right]$

(b) 4 points $\frac{d}{du} [\sin(3u) \sin(5u)]$

(c) 4 points $\frac{d}{dt} \left[\frac{t}{5} - \frac{5}{t} \right]$

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3. Let $f(x) = x e^{-6x}$.

(a) 3 points Calculate $f'(x)$

(b) 3 points Calculate $f''(x)$?

(c) 4 points For what values of x is $f(x)$ increasing?

(d) 4 points For what values of x is $f(x)$ concave down?

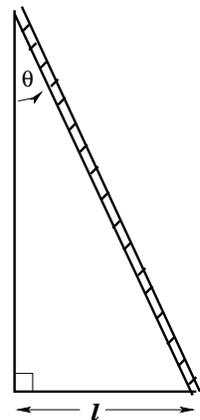
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4. 10 points Write the equation of the line tangent to the curve

$$y = 3x^4 - x + \sqrt{x} \quad \text{at } x = 1$$

5. 10 points A ladder 12 feet long rests against a vertical wall. Let θ be the angle between the top of the ladder and the wall, and let ℓ be the distance from the bottom of the ladder to the wall. If the bottom of the ladder slides away from the wall, how fast does ℓ change with respect to θ when $\theta = \frac{\pi}{6}$?



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6. (a) 8 points Write the equation of the line tangent to the curve

$$x^2 + y^2 = (2x^2 + 2y^2 - x)^2$$

at the point $(0, -1/2)$.

- (b) 5 points Use your answer from the previous part to estimate the y -coordinate of a point on the curve with $x = 0.1$.

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7. 10 points If two resistors with resistance A and B are connected in parallel, the total resistance the total resistance R (in Ω) is given by the formula

$$\frac{1}{R} = \frac{1}{A} + \frac{1}{B}$$

If A is increasing at a rate of $0.3 \Omega/s$ and B is decreasing at a rate of $0.2 \Omega/s$, how fast is R changing when $A = 80\Omega$ and $B = 100\Omega$.

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8. For the function $f(x) = x^3 + 3x^2 - 24x$

(a) 4 points Calculate $f'(x)$.

(b) 4 points At what points does $f(x)$ have a horizontal tangent line?

(c) 6 points For $-3 \leq x \leq 3$, at which x values does $f(x)$ attain its maximum and minimum values?