

MATH 161 - Calculus IA
MIDTERM EXAM 2
November 16, 2006

NAME: _____

U.R. ID Number: _____

Circle your instructor's name and lecture time.

Shannon Starr TuTh 2:00 - 3:15 PM

Sema Salur MWF 9:00 - 9:50 AM

Aaron Heap MWF 10:00 - 10:50 AM

Vijay Sookdeo MWF 10:00 - 10:50 AM

- No calculators, notes, or books are allowed on this exam.
- Please show all your work and justify your answers. You may not receive full credit for a correct answer if insufficient work is shown or insufficient justification is given.
- Clearly label and circle your final answers.

QUESTION	VALUE	SCORE
1.	20	
2.	10	
3.	20	
4.	15	
5.	15	
6.	10	
7.	10	
TOTAL	100	

1. (20 points) Differentiate the following functions. You do not need to simplify your answers.

(a) $f(x) = (3x^2 + 2)^2(8x + 1)$

(b) $g(x) = \frac{\sqrt{x} - 1}{\sqrt{x} + 1}$

(c) $h(x) = x^2 e^{2x}$

(d) $k(x) = \sin x - \arctan x$

(d) $l(x) = \frac{\ln x}{x^2 + 1}$

2. (10 points) A curve C is described by the equation $x^2 + 2xy - y^2 + x = 2$.

(a) Find $\frac{dy}{dx}$.

(b) Find the equation of the tangent line to C at $(1, 2)$.

3. (20 points) Differentiate the following functions. You do not need to simplify your answers.

(a) $f(x) = \frac{1 - e^x}{1 + e^x}$

(b) $g(x) = \arcsin(1 - x^2)$

(c) $h(x) = \ln(\sec x)$

(d) $k(x) = (2x^6 + 5)^8$

4a. (5 points) Without using L'Hospital's rule, evaluate the following limit.

$$\lim_{x \rightarrow 0} \frac{\sin 6x}{4x}$$

4b. (5 points) Evaluate $f^{(286)}(x)$ of $f(x) = \sin x$.

4c. (5 points) Find the linearization of $f(x) = \cos x$ at $a = \pi/2$.

5. (15 points) Use logarithmic differentiation to calculate the derivatives of the following functions.

(a) $f(x) = (\ln x)^{\cos x}$

(b) $g(x) = x^{e^x}$

(c) $h(x) = \sqrt{3x+5} \cdot (2x^2+3)^{\frac{3}{4}}$

6. (10 points) Two cars start moving from the same point. Prof. Sookdeo, in his new Ferarri, travels south at 60 mi/h while Prof. Heap, in his used Pinto, travels west at 25 mi/h. How fast is the distance between the cars increasing two hours later. (Hint: $120^2 + 50^2 = 130^2$)

7. (10 points) A snowball is rolling down a hill and getting bigger. As it picks up snow, the volume of the snowball increases at a rate of 1 cubic-foot per second, that is $1 \text{ ft}^3/\text{sec}$. Assuming that the snowball is perfectly round, calculate the rate the radius is increasing at the moment when the volume is $\frac{4}{3}\pi \text{ ft}^3$.