MATH 2250

Midterm Exam I

February 24, 2011

NAME (please print legibly): _____

Your University ID Number: _____

Please complete all questions in the space provided. You may use the backs of the pages for extra space, or ask me for more paper if needed. Work carefully, and try to complete the problems you find easier before going back to the harder ones. Good luck!

QUESTION	VALUE	SCORE
1	15	
2	10	
3	10	
4	10	
5	10	
6	10	
7	15	
8	10	
9	10	
TOTAL	100	

1. (15 points) Please write down the product, quotient, and chain rules:

$\frac{d}{dx} f(x)g(x) =$

ANSWER: _____

$\frac{d}{dx} \frac{f(x)}{g(x)} =$

ANSWER: _____

$\frac{d}{dx} f(g(x)) =$

ANSWER: _____

2. (10 points) Compute the derivative of the function

$$f(x) = \frac{\cos x}{e^x}$$

ANSWER: _____

3. (10 points) Compute the derivative of the function

$$f(x) = \sin(4x^3 + 5x - 1).$$

ANSWER: _____

4. (10 points) Find the equation of the tangent line to $y = \cos(2x + 2)$ at $x = 1$.

ANSWER: _____

5. (10 points) Find the maximum value of $f(x) = x^3 - 6x^2 + 9x$ on the interval $[-1, 2]$.

ANSWER: _____

6. (10 points) Find the derivative of

$$f(x) = (54x + \cos x)^{342}.$$

ANSWER: _____

7. (15 points) A car is traveling in a straight line at 60 mph when it slams on the brakes. The driver slams on the brakes at time $t = 0$ resulting in a constant acceleration of $-1200\,\text{mph}^2$ (unfortunately, "miles per hour squared" really is the right unit for acceleration in these units). If the position of the car (in miles) is given by $x(t)$ where t is measured in hours,

Find $x(t)$.

ANSWER: _____

Find the velocity $v(t)$.

ANSWER: _____

When does the car stop? How far does the car travel before it stops?

ANSWER: _____

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8. (10 points) Find the derivative of

$$f(x) = \ln\left(\frac{4x+3}{2x+1}\right).$$

ANSWER: _____

9. (10 points) We can write $10 = e^{\ln 10}$. Use this fact, the laws of exponents, and the derivative rules that you know to compute the derivative of

$$f(x) = 10^x = (e^{\ln 10})^x.$$

ANSWER: _____