

MATH 2250

Final Exam II

December 16, 2005

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	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	20	
8	10	
9	10	
10	10	
11	10	
12	10	
13	10	
14	10	
TOTAL	150	

1. (10 points) If the function $f(x)$ is given by

$$f(x) = \frac{7 + x^3}{8 - 3x}, \quad (1)$$

Please find the derivative $f'(x)$.

ANSWER: _____

2. (10 points) If the function $f(x)$ is given by

$$f(x) = 7x + 24/x^2, \quad (2)$$

Please find the equation for the tangent line to the function at $(2, 20)$.

ANSWER: _____

3. (10 points) If the function $f(x)$ is given by

$$f(x) = \arccos x + 4 \tan x, \quad (3)$$

Please find the derivative of $f(x)$.

ANSWER: _____

4. (10 points) Use the definition of the derivative as a limit to find the derivative of the function

$$f(x) = x^2 + 2x \quad (4)$$

ANSWER: _____

5. (10 points) Suppose that $f'(x) = 2f(x) + 3x$. If $f(3) = 4$, use tangent-line approximation to estimate the value of $f(3.1)$.

ANSWER: _____

6. (10 points) The function

$$f(x) = \frac{x^2 - 25}{x^3 - 27}. \quad (5)$$

Find all **horizontal and vertical** asymptotes of this function.

ANSWER: _____

7. (20 points) This problem has two parts. Be sure that you answer both! The function $f(x)$ is given by

$$f(x) = \frac{x^3}{3} - x^2 - 3x + 7. \quad (6)$$

Part A Find the intervals on which $f(x)$ is increasing and decreasing.

ANSWER: _____

Part B Find the x values of the local minima and maxima of $f(x)$.

ANSWER: _____

8. (10 points) A particle is moving along the curve $y = \sqrt{2x + 1}$. As the particle passes through the point $(4, 3)$, its x -coordinate increases at a rate of 3 units per second. Find the rate of change of the distance from the particle to the origin at this time.

ANSWER: _____

9. (10 points) Evaluate the definite integral

$$\int_{-1}^1 x^3 - 3x + 5 dx. \quad (7)$$

ANSWER: _____

10. (10 points) Evaluate the indefinite integral

$$\int 8xe^{4x^2} dx, \quad (8)$$

then differentiate your answer to be sure that it is correct.

ANSWER: _____

11. (10 points) Use integration by parts to evaluate the integral

$$\int x^2 \ln x \, dx. \quad (9)$$

and then differentiate your answer to be sure that it is correct.

ANSWER: _____

12. (10 points) Find the integral

$$\int \frac{10}{(x-1)(x+1)} dx. \quad (10)$$

ANSWER: _____

13. (10 points) Solve the differential equation

$$y' = \frac{x}{2y} \tag{11}$$

with the initial condition $y(2) = 7$.

ANSWER: _____

14. (10 points) Use your calculator and Simpson's rule to estimate the value of

$$\int_{-1}^1 e^{x^2} dx \quad (12)$$

using $n = 4$.

ANSWER: _____