

10/9/2002
Dr. Lunsford

MA303 Calculus I
Test 2

Name: _____
(100 Points Total)

Neatly show all of your work. Clearly indicate your answers. Good Luck!

I. Use the definition of the derivative function to find the derivative of

$$f(x) = 2 - 3x - x^2. \text{ (8 points)}$$

II. Basic Derivatives and Limits. Find the indicated derivatives and limits. (4 points each – 24 points total)

1. $y = \tan 6x$

$$\frac{dy}{dx} =$$

2. $z = \frac{x^4 - 3x + 2}{x}$

$$\frac{dz}{dx} =$$

3. $f(t) = (8 - t)^4$

$$f'(t) =$$

4. $w = \frac{3}{7 - \theta}$

$$\frac{dw}{d\theta} =$$

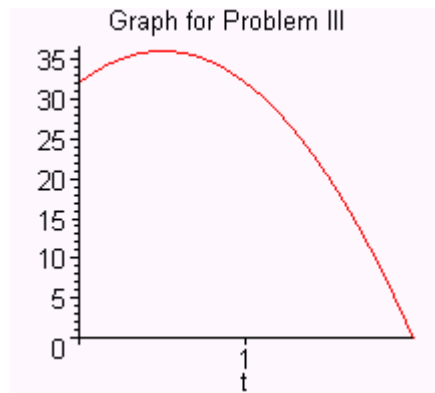
II. Basic Derivatives and Limits, continued.

5. $\lim_{x \rightarrow -\infty} 7x^2 - 3x^3 + 11x + 9$

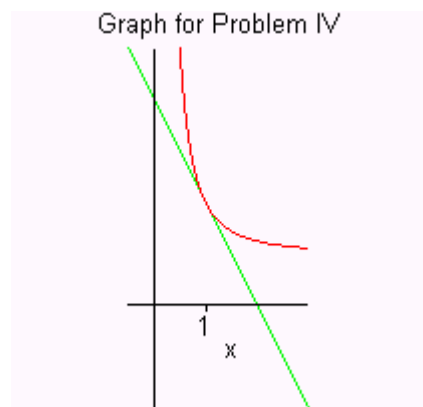
6. $\lim_{x \rightarrow \infty} \frac{4x^2 - 8x + 12}{7 - 3x - 10x^2}$

III. A diver jumps from a diving board that is 32 feet above the water. The height of the diver (in feet) is given by the function $h(t) = -16t^2 + 16t + 32$ where t is in seconds. Please answer the following questions. Neatly show all of your work below. Clearly indicate your answers. (4 points each – 16 total)

- (a) Find the average velocity of the diver from time $t = 0$ to $t = 1$ seconds. Draw the line on the graph whose slope represents this velocity.
- (b) Find the velocity of the diver at $t = 1$ second. Draw the line on the graph whose slope represents this velocity.
- (c) At what time does the diver hit the water?
- (d) What is the diver's velocity at the instant she hits the water?



IV. The line l is tangent to the graph of $y = \frac{1}{x^2} + 1$ at $x = 1$. Find the y -intercept of the line. Indicate the intercept on the graph below. (8 points)



V. Find the indicated derivatives. (7 points each – 28 total)

1. $f(x) = \frac{x^4 \cos 3x}{x^2 - x}$

$D_x f(x) =$

2. $w = \sqrt{x^5} \sec 6x$

$\frac{dw}{dx} =$

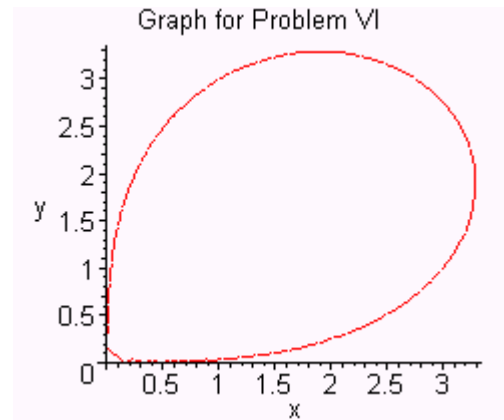
3. $g(x) = (3x^3 - 2x + 1)^8 (x^4 - 8x^2 + x)^{-5}$

$g'(x) =$

4. $y = \sin^3(x^2 - 7x + 3)$

$\frac{dy}{dx} =$

VI. Below you are given a portion of the graph of $3(x^2 + y^2)^2 = 100xy$. Find the slope of the tangent line to the graph at the point $(x, y) = (3, 1)$. Draw the tangent line on the graph. (8 points)



VII. A man 6 feet tall walks at a rate of 5 feet per second away from a light that is 15 feet above the ground. At what rate is the tip of his shadow moving when he is 10 feet from the base of the light? Neatly show all of your work, clearly indicate what your variables represent, and clearly indicate your answer. (8 points)