

10/12/2000
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

$$f(x) = 2x^2 - 3x + 1. \text{ (10 points)}$$

II. Basic Derivatives. Find the indicated derivatives. (4 points each – NO PARTIAL CREDIT – 16 points total)

1. $y = \cos 6x$

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

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

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

3. $f(t) = (1-t)^2$

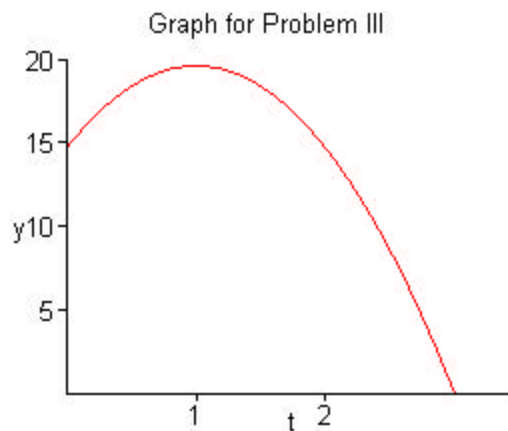
$$f'(t) =$$

4. $w = \frac{4}{1+q}$

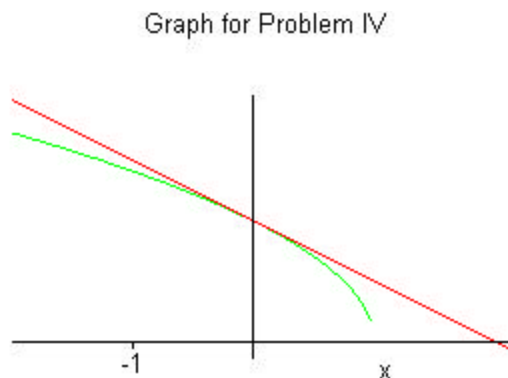
$$\frac{dw}{dq} =$$

III. A ball is thrown straight up from an initial height of 14.7 meters. The height function of the ball is given by $h(t) = -4.9(t^2 - 2t - 3)$ where t is in seconds and $h(t)$ is in meters. Please answer the following questions. Neatly show all of your work below. Clearly indicate your answers. (5 points each – 20 total)

- Find the average velocity of the ball from time $t = 1$ to $t = 2$ seconds. Draw the line on the graph below whose slope represents this velocity.
- Find the velocity of the ball at $t = 2$ seconds. Draw the line on the graph below whose slope represents this velocity.
- How fast is the ball moving the instant it hits the ground (i.e. what is the impact velocity of the ball)?
- Find the acceleration of the ball at time $t = 2$ seconds.



IV. The line l is tangent to the graph of $y = \sqrt{1-x}$ at $x = 0$. Find the x -intercept of the line. Indicate the intercept on the graph below. (8 points)



V. Find the indicated derivatives. (6 points each – 30 total)

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

$D_x f(x) =$

2. $y = \frac{2t^3}{(1-t)^3}$

$\frac{dy}{dt} =$

3. $w = \sqrt[3]{x^4} \sec 4x$

$\frac{dw}{dx} =$

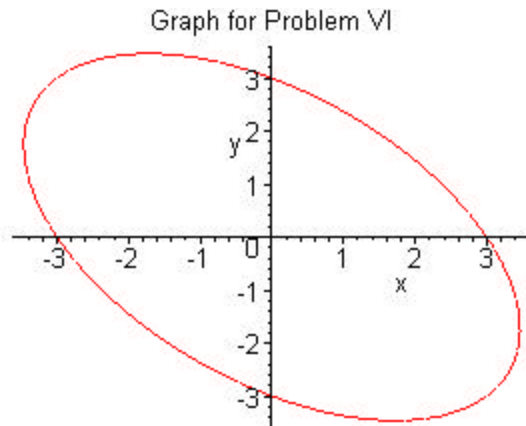
4. $g(x) = (x^2 + 3x - 1)^9 (x^4 + 7x + 11)^8$

$g'(x) =$

5. $y = \sin^4(x^3 - 7x + 1)$

$\frac{dy}{dx} =$

VI. Below you are given the graph of $x^2 + xy + y^2 = 9$. Find the slope of the tangent line to the graph at the point $(x, y) = (0, 3)$. Draw the tangent line on the graph. (8 points)



VII. An ice cube is melting at the rate of one cubic inch per hour. Assuming the ice cube remains in the shape of a cube as it melts, find the rate of change of the surface area of the cube when the volume of the cube is eight cubic inches. Neatly show all of your work, clearly indicate what your variables represent, and clearly indicate your answer. (8 points)