**AP Calculus AB – Chapter 4 Test 2 Review Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**4.4 Optimization**

1. If y = -3x + 12, what is the maximum value of the product xy?

**4.6 Related Rates**

2. The radius of a circle is increasing at a constant rate of 0.5 feet per second. What is the rate of increase in the area of the circle at the instant when the circumference of the circle is 10π feet?

3. In the right triangle with a hypotenuse of 13, if θ increases at a constant rate of 2 radians per minute, at what rate is y (the side opposite θ) increasing in units per minute when y equals 5 units?

4. The volume of a cylindrical can without a top is to be 4π cubic inches. If a minimum amount of metal is to be used to construct the can, what must be the radius, in inches, of the can?

**Previous Material**

5. Let *f* be the function with derivative given by *f* ‘(x) = cos(x3). How many relative extrema does *f* have on the interval -2 < x < 1 ?

6. Let *f* be the function with derivative given by  *f* ‘(x) = x3 – 16/x . On which interval(s) is *f* increasing?

7. The velocity of a particle moving along the x-axis is given by the function v(t) = 2e2t + t et . What is the average velocity of the particle from time t = 0 to time t = 1?

8. Let *f* be defined as *f* (x) = $\left\{\begin{array}{c} 2x-3 , if x \leq 1\\5x-6 , if x>1\end{array}\right.$ Is f(x) continuous and/or differentiable at x = 1?

9. If f(x) = x2 – 3x, then $\frac{dy}{dx}$(f(ex)) is ?

10. Let g be a twice-differentiable function with g’(x) > 0 and g’’(x) > 0 for all real numbers x, such that
 g(3) = 1 and g(4) = 5. Of the following, which is a possible value for g(5)? (A) 5 (B) 9 (C) 12

11. If cos(y2) = 4x, then dy/dx is ?

**Free Response Questions**

Consider the curve defined by -x2 + 3xy + y3 = 3

(a) Find dy/dx.

(b) Write an equation for the line tangent to the curve at (2, 1).

(c) There is a number k such that (2.1, k) is on the curve. Using the tangent line in part (b), approximate the value of k.

(d) Write an equation that can be solved to find the actual value of k such that (2.1, k) is on the curve.

(e) Solve the equation in part (d) for the value of k.

The volume V of a cone (V = 1/3 π r2 h) is increasing at the rate of 20π cubic ft. per second. At the instant when the radius, r, of the cone is 5 ft., its volume is 25π cubic ft. and the radius is increasing at 1 ft. per second.

(a) What is the rate of change of the area of its base?

(b) What is the rate of change of its height, h?