

Math 16A (Fall 2007)
Kirkbride
Final Review

The final will expect you to know everything that we have covered, but will have emphasis on applications of derivatives. Working on these problems is NOT ENOUGH to ensure a good grade on the final. Doing problems from the Chapter Reviews, going over notes and homework, and coming to the review are others way to study.

1. Find the derivative of the following functions. Do NOT simplify.

a) $f(x) = \frac{\sqrt{5 + 2x}}{\cos(3x + 1)}$

b) $y = \tan^3(\sin(5x))$

c) $f(x) = x(1 - 4x^2)^2$

d) Find $\frac{dy}{dx}$ if $2x^{1/3}y^2 + 3y^{1/2} \tan y = 10$

2. A baseball is hit straight upward. Its height above the ground after t seconds is $h(t) = 128t - 16t^2$.

a) How long is the ball in the air?

b) What is the ball's maximum height?

c) What is the ball's velocity as it strikes the ground?

d.) What is the ball's acceleration as it strikes the ground?

3. Find two numbers x and y so that their sum is 10 and the sum $S = x^2 + 4y^2$ is a minimum. Your answer should include x , y and the minimum S .

4. Find the point (x, y) on the graph of $y = 1 + \sqrt{x}$ which is nearest to the point $(\frac{9}{2}, 1)$.

5. The circumference of a circle is increasing at the rate of $2\frac{ft}{sec}$. At what rate is the area of the circle changing when the radius of the circle is 6ft?

6. Sketch the graph of the following functions by labeling the intercepts, relative extrema, points of inflection, and horizontal and vertical asymptotes.

a) $f(x) = \frac{x+1}{x-1}$

b) $f(x) = \frac{x-5}{x^2-4}$

7. A fence is to be built to enclose a rectangular region of 4800 square feet. The fencing material along three sides costs \$3 per foot. The fencing material along the fourth side costs \$4 per foot. Find the most economical dimensions of the region.
8. Find A, B, and C if the function $f(x) = x^3 + Ax^2 + Bx + C$ has an inflection point at $x = -\frac{17}{6}$, a critical point at $x = \frac{1}{3}$, and a y-intercept of 3.
9. Find the value of dy when $x = 2$ and $dx = .001$ for $f(x) = x^4$.
10. An airplane is attempting to drop a box onto a house. The house is 300 feet away in horizontal distance and 400 feet in vertical distance. The rate of change of the horizontal distance with respect to time is the same as the rate of change of the vertical distance with respect to time. How is the distance between the box and the house changing with respect to time if the rate of change in the horizontal direction with respect to time is -50 feet per second?
11. Water is pumped from a cone shaped reservoir (the vertex is pointed down) 10 ft in diameter and 10 ft deep at a constant rate of $3\frac{ft^3}{min}$. How fast is the water level falling when the depth of the water is 6 ft?
12. A wood chest is rectangular in shape with its length along the front twice as long as its width. The top, front and sides of the chest are to be made with oak, while the back and bottom are made of pine. The chest is to have a total volume of $.25m^3$. If the oak costs three times more than the pine, find the dimensions that will minimize the cost of the chest.