Homework 10

§4.2#5, 15, 17, **26**, **38**

§4.3#1, 7, 33, **20**, **30**, **42**

§4.2 #5. Find the global maximum and minimum of the function $f(x) = x^4 - 8x^2$ on the interval $-3 \leq x \leq 1$.

§4.2 #15. Find the exact global maximum and minimum values of the function $f(x) = x + \frac{1}{x}$ for $x > 0$.

§4.2 #17. Find the exact global maximum and minimum values of the function $f(x) = x - \ln(x)$ for $x > 0$.

§4.2 #**26**. A grapefruit is tossed straight up with an initial velocity of 50 ft/s. The grapefruit is 5 feet above the ground when it is released. Its height, in feet, at time t seconds is given by $y = -16t^2 + 50t + 5$. How high does it go before returning to the ground?

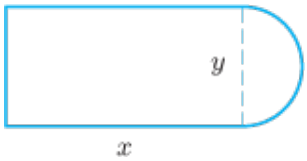
§4.2 #**38**. Two points on a curve $y = \frac{x^3}{1+x^4}$ have oppositve x-values, x and $-x$. Find the points making the slope of the line joining them greatest.

§4.3 #1. The sum of two nonnegative numbers is 100. What is the maximum value of the product of these two numbers?

§4.3 #7. An open-topped rectangular box with a square base x by x cm and height h cm has volume 8cm^3. Find the dimensions that minimize the surface area.

§4.3 #33. A smokestack deposits soot on the ground with a concentration inversely proportional to the square of the distance from the stack. With two smokestacks 20 miles apart, the concentration of the combined deposits on the line joining them, at a distance x from one stack, is given by $S = \frac{k_1}{x^2} + \frac{k_2}{(20-x)^2}$ where k_1 and k_2 are positive constants which depend on the quantity of smoke each stack is emitting. If $k_1 = 7k_2$, find the point on the line joining the stacks where the concentration of the deposit is a minimum.

§4.3 #**20**. Consider the figure below in which a semicircle is joined to a rectangle.



a) Find a formula for the area.

b) Find a formula for the perimater.

c) Find the dimensions x and y that maximize the area given that the perimeter is 100.

§4.3 #**30**. What are the dimensions of the closed cylindrical can that has surface area 280cm^2 and contains the maximum volume?

§4.3 #**42**. On the same side of straight river are two towns, and the townspeople want to build a pumping station, S. See the figure below. The pumping station is to be at the river;s edge with pipes extending straight to the two towns, Where should the pumping station be located to minimize the total length of pipe?