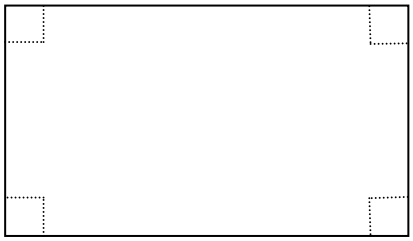
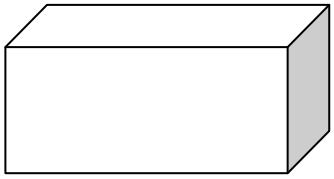
AP Calculus AB: Problem Set #7

Solve each of the following problems using Calculus. Show all work!!

1. An open box is to be made from a 8.5 in by 11 in piece of cardboard by cutting out squares of equal size from the four corners and bending up the sides.





Let x be the length of each of the squares to be cut out. Find the maximum volume possible and the value of x that will provide this maximum volume.

2. Find the radius and height of the right circular cylinder of largest volume that can be inscribed in a right circular cone with radius 6 inches and height 10 inches.

3. A rectangle has its two lower corners on the *x*-axis and its two upper corners on the curve $y = 16 - x^2$. For all such rectangles, what are the dimensions of the one with the largest area?

4. A rectangular area of 3200 sq. ft. is to be fenced off. Two opposite sides will use fencing costing $1 per linear foot and the remaining sides will use fencing costing $2 per linear foot. Find the dimensions of the rectangle with the least cost.

5. A container with square base, vertical sides, and open top is to be made from 1000 sq. ft of material. Find the dimensions of the container with the greatest volume.

6. A firm determines that x units of its product can be sold daily at p dollars per unit where $x = 1000 - p$. The cost of producing x units per day is $C(x) = 3000 + 20x$

a. Find the revenue function $R(x)$

b. Find the profit function $P(x)$

c. Assuming that the production capacity is at most 500 units per day, determine how many units the company must product and sell each day to maximize the profit.

d. Find the maximum profit.

e. What price per unit must be charged to obtain the maximum profit?