Section 5.6: Optimization and Modeling Section Objectives:

- Set-up mathematical models for different situations.
- Solve for minimum and maximum values of functions in modeling problems.

Practice Problems

1. A poster is 10 inches longer that it is wide. Find a function that models its area A in terms of its width w.



2. A rectangle is inscribed in in a semicircle of radius 10. Find a functions that models the area A of the rectangle in terms of its height h. Then find the height h that maximizes area.

Since the point (w,h) is on

$$W = (100 - h^2)^{1/2} \cdot h$$

thus $A = 2W \cdot h$ easter to have
 $A = 2W \cdot h$ where his height and
 $W = 1/2$ the
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3. Jordan charges \$20 an hour for tutoring. He currently tutors 5 hours a week. He knows he will be able to tutor an additional two hours a week for every \$5 he drops his prices. What rate should he charge to maximize revenue? How many hours a week will he tutor to maximize prevenue?

Want to maximize revenue
Revenue =
$$(price per hair)$$
 # hours tutored)
price per hour is Now \$20 diops \$5 per 2 hr increases
Let x be # of 2 hr increases
(20-5x)
hours hubbled is new 5 hrs
increases \$2 per x increases
(20-5x)
hours hubbled is new 5 hrs
increases \$2 per x increases
(5+2x)
Find R'(x) = 0
 $x = \frac{15}{20} = \frac{3}{4} = .75$
 $x = 10x^2 + 15x + 100$
(5+2,15) = 6.5

4. A company wishes to design a rectangular box with square base and no top. It needs to have a volume of 27 cubic inches. The cost per square inch for the bottom of the box is \$6 and for the sides is \$3. What dimension minimize the cost of the box? What is the minimum cost?

$$V = 27 \ln^{3}$$

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$$V = 27 \ln^{3}$$

$$\int_{Bottom}^{2} \int_{Bottom}^{2} \int_{B$$

 $12l = 324 = 712l^{5} = 324$ $\rightarrow l^3 = 27$ $\Rightarrow l = 3$ (huck max/min ". $C' = 12l - \frac{324}{l^2}$







5. A farmer wants to build a rectangular pen on the side of his 20ft by 20ft square barn. He only needs to fence in three of the sides since the other side must lie completely along the side of the barn. He has 50 feet of fencing. What is the area and dimensions of the largest area he can fence in? Draw a picture of the maximum size pen.

What if his barn was 30ft by 30ft and he wanted to build a fence with 50ft of fencing?

