Honors Analysis
Copy original problem.
Convince *me* that **you** understand the concept!

Name ______________________

Per ________ Date __________

Chapter 4 Applications Exam

I Among all right triangles with hypotenuse 2, determine (using calculus, of course) the side lengths of the one with the largest area. **Justify**, as usual. (hint: Draw a picture. Something *has* to be *x*.) (15 pts)

II Find $\frac{dy}{dx}$ at $(-1, 2\pi)$ when $xy + x\sin y = -2\pi$. (15 pts)

III The length of a rectangle is increasing at a rate of seven feet per second. The width is decreasing at a rate of three feet per second. When the length is twelve feet and the width is five feet, find the rate of change of: (25 pts tot)

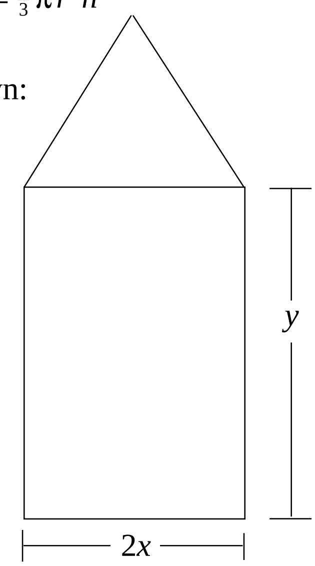
a) the area b) the perimeter c) the length of a diagonal

IV A conical reservoir with radius equal to one-third its height is filling with water at a rate of ten cubic inches per second. How fast is the water level rising when there are one thousand cubic inches of water in the tank? The volume of a cone with height h and radius r is given by: $v = \frac{1}{3}\pi r^2 h$ (20 pts)

V An equilateral triangle is attached to the top of a rectangle as shown: (25 pts)
The total perimeter (distance around the exterior of the figure) is exactly 200 feet. For the figure to enclose a maximum area, show that the base of the rectangle would be:

$$\frac{200}{6-\sqrt{3}}$$

Justify using the $f''(x)$ test.
Hint: 30-60-90 triangle —> 1 : 2 : $\sqrt{3}$



Extra Credit **5 pts**

Ten thousand pounds of beef in cold storage are worth one dollar and sixty cents per pound, wholesale. If the price increases steadily at ten cents a pound per week while the beef loses a hundred pounds a week in weight (due to shrinkage) and the storage costs are six hundred dollars per week, how many weeks should the beef be held before selling for the greatest net value?