**Advanced Placement Calculus** Name _____

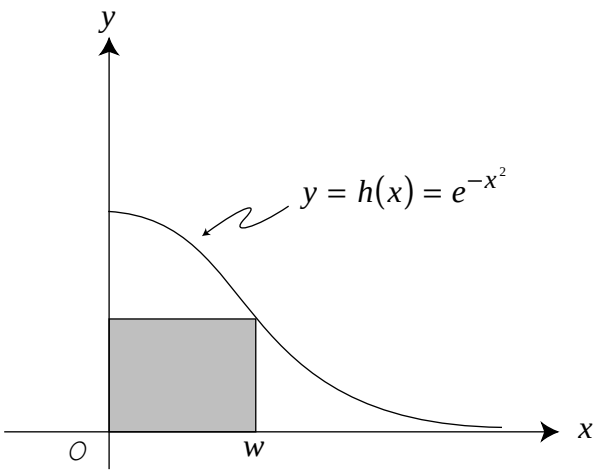
Copy original problem. Per _____ Date _____

Convince *me* that **you** understand the concept***!***

***No Calculators, of course.***

# Chapter 6 Application Exam

**I** Let $A(w)$ be the area of the shaded rectangle shown in the figure. Show that $A(w)$ has its maximum value when $w$ is the $x$-coordinate of the point of inflection of the graph of $h$. Does the shaded rectangle have maximum perimeter at this same value of $w$? Is that a surprising result? (40 pts)




**II** A rectangular swimming pool is to be built with water surface area of 1800 square feet. The owner wants 5-foot wide decks along either side and 10-foot wide decks at the two ends. The owner will fence the property at a cost of $10 per linear foot of fence. The owner wants to know the costs for fencing the smallest piece of property on which the pool can be built satisfying these conditions. Be *very* careful to have a function which is properly notated (explained and/or justified). (30 pts)

**III** The cost of fuel to propel a boat through the water (in dollars per hours) is proportional to the cube of the speed. A certain ferry boat uses $100 worth of fuel per hour when cruising at 10 miles per hour. Apart from fuel, the cost of running this ferry (labor, maintenance, and so on) is $675 per hour. At what speed should the ferry travel so as to minimize the costs? Be *very* careful to have a function which is properly notated (explained and/or justified). (30 pts)

**Extra Credit ---------- 5 pts ----------**

Given $g(x) = \dfrac{\ln x}{x}$ and $x > 0$. Specifically indicate any significant points on the graph of $g(x)$. Be sure all conclusions are well justified.