



Examples 7.4 – The Extreme Value Theorem and Optimization

1. (a) Find the absolute maximum and minimum values of $f(x) = 4x^2 - 12x + 10$ on $[1, 3]$.
State where those values occur.

- (a) Find the absolute maximum and minimum values of $g(x) = x^2 + \frac{2000}{x}$ on $(0, +\infty)$, if they exist. State where those values occur.

Solution: (a)

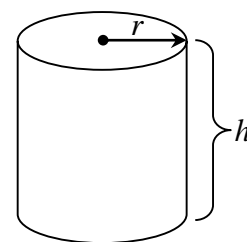
(b)

2. Suppose a closed cylindrical can is to hold 1000 cm^3 (1 liter) of liquid. Find the height and radius of the can that requires the least amount of material.

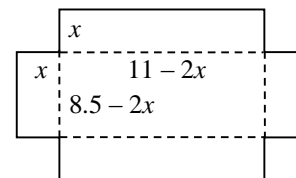
Solution: Equations: $V = \pi r^2 h = 1000$ $A = 2\pi r^2 + 2\pi r h$

Function: $A(r) = 2\pi r^2 + \frac{2000}{r}$, $r > 0$

Minimize A :



3. An open top container is to be made from a piece of 8.5-inch by 11-inch cardboard by cutting out squares of equal size from the four corners and bending up the sides. What length should the squares be to obtain a box with the largest volume?



Solution: