4.6

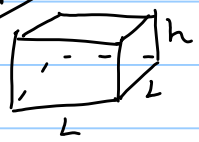
Note Title 10/28/2007

Optimization Problems

1. Read Carefully
2. Draw pic
3. Introduce variables
4. Write an equation: "thing to be max/minned" = get it in terms of just one variable.
5. find domain of equation
6. find min/max in the domain (ans question)

(ex.) A box w/ a square base & open top must have a volume of 32,000 cm^3. Find the dimensions that minimize material used.

#2 & #3



$V = 32{,}000\ cm^3$

m = amt of material used

#4. $m = L^2 + 4Lh$, $V = L^2 h = 32{,}000$

$h = 32000/L^2$

$m = L^2 + 4L\left(\frac{32000}{L^2}\right)$

$m = L^2 + 128000/L$

#5 $L > 0$

#6. $m' = 2L - 128000/L^2 = 0 \Rightarrow L^3 = 64000$

$L = 40$ (40cm x 40cm x 20 cm)

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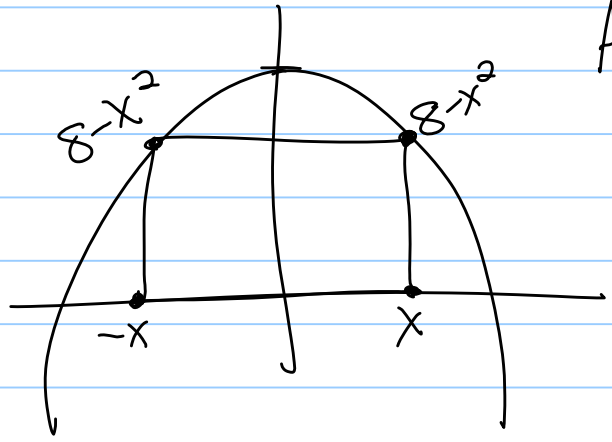
Maximize area of rectangle w/ base on x-axis & other vertices above x-axis & on $y = 8 - x^2$



$A = l \cdot w$

$= (2x)(8 - x^2)$

$= 16x - 2x^3$

$A' = 16 - 6x^2$

$A' = 0 \Rightarrow x = \sqrt{8/3}$

dimensions $2\sqrt{8/3} \times 16/3$