

Libraries Documents Calc chapter 3 Search chapter 3

Organize Share with Burn New folder

Documents library Arrange by: Folder

3.9 3.1 continued 3.1 continued.note book class notes 3.1 relative extrema 3.1 relative extrema.notebo ok class 3.2 review 3.3 first derivative test 3.3 increasing and decreasing original notes

3.3 increasing and decreasing 3.4 notes 3.5 infinity limits and HA 3.5 infinity limits and HA.notebook day 2 3.5 infinity limits and HA.notebookcla ss 3.6 graphs 3.6 symmetry contin 3.2

end of 3.4 concavity end of 3.5 review 3.3 review for mini quiz review homework 3.1 day 2 review hw 3.1 notes on 3.2

22 items

### 3.7 Optimization Problems

Design an open box having a square base with a surface area of 108 square inches. What dimensions will produce a box with a Maximum Volume?

Primary: is what is being optimized!  
(this one we will take Derivative of)

Secondary: is the equation we have information about!

① S.E: Surface Area = 108

$$SA = x^2 + 4xh$$

$$108 = x^2 + 4xh$$

② Solve for the Easiest variable in S.E.

$$\frac{108 - x^2}{4x} = \frac{4xh}{4x}$$

$$\boxed{\frac{108 - x^2}{4x} = h}$$

③ Primary EQ:  $V = x^2h$

④ Plug in:  $V = x^2 \left( \frac{108 - x^2}{4x} \right)$   $\rightarrow \frac{108x^2}{4x} - \frac{x^4}{4x}$

$$V = 27x - \frac{1}{4}x^3$$

⑤  $V' = 27 - \frac{3}{4}x^2$

$$0 = 27 - \frac{3}{4}x^2$$

$$27 = \frac{3}{4}x^2$$

⑥  $V'' = -\frac{3}{2}x$

$V''(6) < 0$

So V is concave Down therefore we have a max!

$$\frac{108 - x^2}{3} = \frac{3x^2}{3}$$

$$36 = x^2$$

$$x = 6 \text{ in}$$

⑦  $h = \frac{108 - x^2}{4x}$

$$\boxed{h = 3}$$

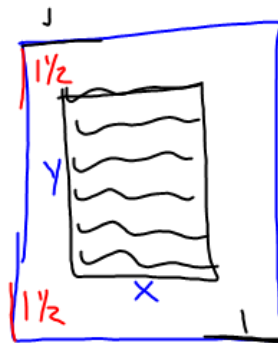
$$\boxed{6 \text{ in} \times 6 \text{ in} \times 3 \text{ in}}$$

$$V(0) = 0$$

$$V(6) = 108$$

$$V(\sqrt{108}) = 0$$

# Find Min Area



24 square of Print

\* Find the Dimensions of the least amount of paper!

$$\textcircled{1} \quad xy = 24 \quad (\text{s.e.})$$

$$\textcircled{2} \quad y = \frac{24}{x}$$

$$\textcircled{3} \quad A = (x + 2)(y + 3) \quad \text{Primary}$$

$$\textcircled{4} \quad A = (x + 2)\left(\frac{24}{x} + 3\right)$$

$$A = 24 + 3x + \frac{48}{x} + 6$$

$$A' = 3 - \frac{48}{x^2} \quad \rightarrow 48x^{-1}$$

$$0 = 3 - \frac{48}{x^2}$$

$$3 = \frac{48}{x^2}$$

$$3x^2 = 48$$

$$x^2 = 16$$

$$\boxed{x = 4}$$

$$y = \frac{24}{4} = 6$$

$$x = 4, y = 6 \quad (\text{Print})$$

$$\text{Paper: } 6 \times 9$$

Pg 223

19, 20