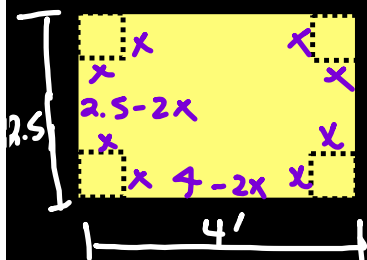


VOLUME

6.



Maximize volume.

$$V = lwh$$

$$* V = (4-2x)(2.5-2x)x$$

$$V = (10 - 8x - 5x + 4x^2)x$$

$$* V = 4x^3 - 13x^2 + 10x$$

$$(0, 1.25)$$

$$\lim_{x \rightarrow 0} 4x^3 - 13x^2 + 10x = 0$$

$$\lim_{x \rightarrow 1.25} 4x^3 - 13x^2 + 10x = 0$$

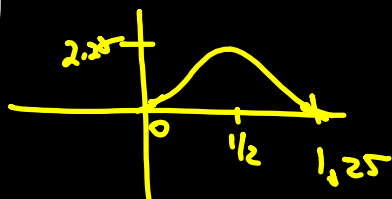
$$V' = 12x^2 - 26x + 10$$

$$0 = 2(6x^2 - 13x + 5)$$

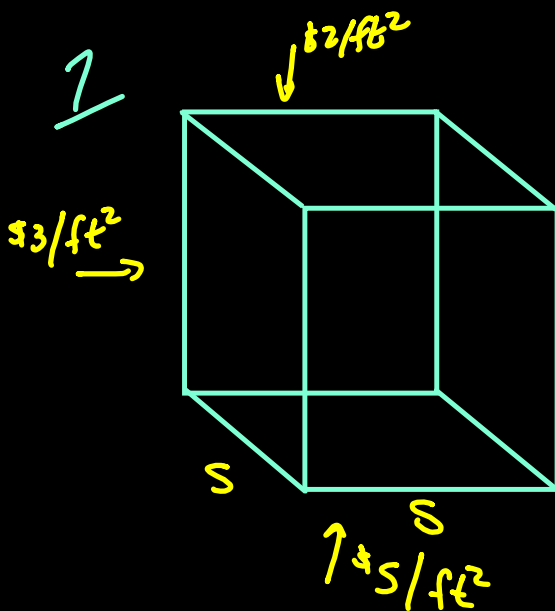
$$0 = 2(2x - 1)(3x - 5)$$

$$x = 1/2 \quad x = 5/3$$

$1/2$	$3 \times 1.5 \neq 0.5 = 2.25$
$5/3$	



$1/2$ squares



\$756

$$V = s^2 h$$

$$5s^2 + 2s^2 + 3 \cdot 4sh = 756$$

$$7s^2 + 12sh = 756$$

$$\frac{12sh}{12s} = \frac{756 - 7s^2}{12s}$$

$$h = \frac{63}{s} - \frac{7}{12}s$$

$$(0, \sqrt[3]{108}) \quad \begin{matrix} 7s^2 = 756 \\ \sqrt{s^2} = \sqrt{108} \end{matrix}$$

$$V = s^2 \left(\frac{63}{s} - \frac{7}{12}s \right)$$

$$\lim_{s \rightarrow 0} 63s - \frac{7}{12}s^3 = 0$$

$$\lim_{s \rightarrow \sqrt[3]{108}} 63s - \frac{7}{12}s^3 = 0$$

$$\begin{array}{r} 6 \overline{) 252} \\ \underline{6} \\ 252 \end{array}$$

$$6' \times 6' \times 7'$$

$$V = 63s - \frac{7}{12}s^3$$

$$V' = 63 - \frac{7}{4}s^2 = 0$$

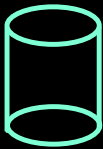
$$\frac{4}{7} \cdot 63 = \frac{7}{4}s^2 \cdot \frac{4}{7}$$

$$\sqrt{36} = \sqrt{s^2}$$

$$6 = s$$

$$h = \frac{63}{6} - \frac{7}{12}(6)$$

$$h = \frac{14}{2} = 7$$



$$V = 16\pi \text{ in}^3$$

Bottom costs twice
as much as sides

$$S_{\text{side}} = h \cdot 2\pi r$$

$$(0, \infty)$$

Minimize Cost

$$C = 2 \cdot \pi r^2 + 2\pi r h$$

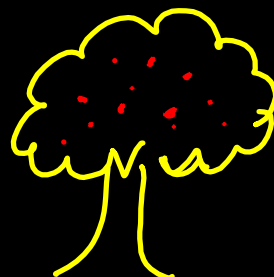
$$\pi r^2 \cdot h = \underline{16\pi}$$

$$h = \frac{16\cancel{\pi}}{\pi r^2}$$

$$C = 2\pi r^2 + 2\pi r \cdot \frac{16}{r^2}$$

$$C = 2\pi r^2 + \frac{32\pi}{r}$$

9 $24 \frac{\text{trees}}{\text{acre}} - 600 \text{ apples/tree}$



$A = 600 \cdot 24 \uparrow \text{tree} \quad \downarrow 12 \text{ apples}$

$A = \# \text{ apples} \cdot \# \text{ trees}$ Maximize apple production

$x = \# \text{ of trees added}$

$$A = (600 - 12x)(24 + x)$$

$$A = 14400 + 600x - 288x - 12x^2$$

$$A = 14400 + 312x - 12x^2$$

$$600 - 12x = 0$$

$$600 = 12x$$

$$50 = x$$

$$A' = 312 - 24x = 0$$

$$312 = 24x$$

$$13 = x$$

$$24 + 13 = \boxed{37 \frac{\text{trees}}{\text{acre}}}$$

$$\begin{matrix} -24 \\ [-0, 50] \end{matrix}$$

0	14,400
13	444.37 = 16428
50	0