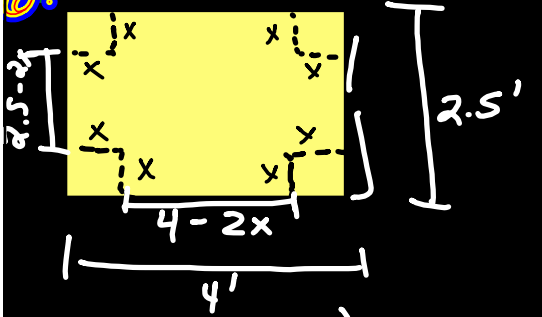
VOLUME

6.



(0, 1.25)

$V = lwh$

$V = (4-2x)(2.5-2x)\,x$

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

$V = (4x^2 - 13x + 10)x$

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

OR

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

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

$V(1/2) = 9/4 = 2.25$ 1/2

1/2' OR 6"

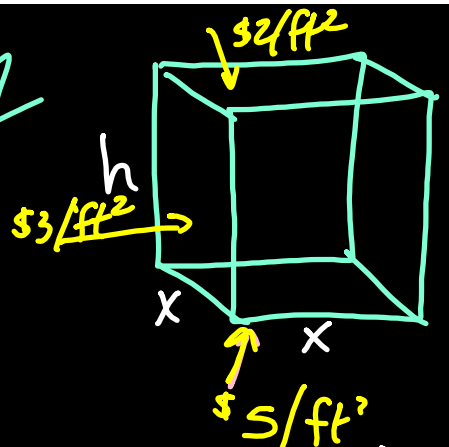
$V' = 12x^2 - 26x + 10$

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

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

$x = 1/2$ ~~$x = 5/3$~~

1



Maximize Volume.

$V = x \cdot x \cdot h = x^2 h$

Cost: $5x^2 + $2x^2 + $3 \cdot 4xh = $756

$7x^2 + 12xh = 756$

$\frac{12xh}{12x} = \frac{756}{12x} - \frac{7x^2}{12x}$

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

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

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

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

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

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

$\pm 6 = x$

$7x^2 = 756$

$\sqrt{x^2} = \sqrt{108}$

$x : (0, \sqrt{108})$

$\lim_{x \to 0} 63x - \frac{7}{12}x^3 = 0$

$\lim_{x \to \sqrt{108}} 63x - \frac{7}{12}x^2 = 0$

$V(6) = 252$

6

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

$= \frac{21}{2} - \frac{7}{2} = \frac{14}{2} = 7$

6′ × 6′ × 7′

Minimize Cost

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

Bottom costs twice as much as sides

$C = 2(\pi r^2) + 2\pi r h$

$\pi r^2 h = 16\pi$

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

$C = 2\pi r^2 + 2\pi r\left(\frac{16}{r^2}\right)$

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

$(0, \infty)$

9 24 trees/acre — 600 apples/tree

↑ tree ↓ 12 apples

$A = (24)(600)$

$A = (\#\text{ of apples/tree})(\#\text{ of trees/acre})$

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

$600 - 12x = 0$

$600 = 12x$

$50 = x$

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

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

$[0, 50]$