18. F: $\dfrac{v}{22+.02v^2}$

$$\frac{(22+.02v^2)(1)-v(.04v)}{(22+.02v^2)^2}$$

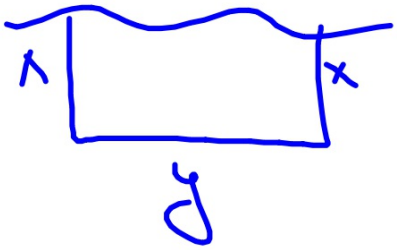
$$\frac{22+.02v^2-.04v^2}{(22+.02v^2)^2}$$

$$22-.02v^2=0$$

$$\frac{22}{.02}=\frac{.02v^2}{.02}$$

$$\sqrt{v^2}=\sqrt{1100}$$

19. $P: 2x+y$



$S: xy=180{,}000$

$\frac{xy}{x} = \frac{180{,}000}{x}$

$y = \frac{180{,}000}{300}$

600

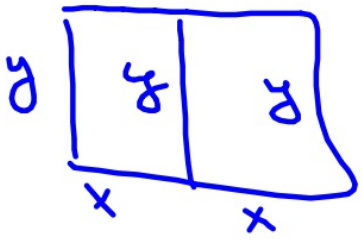
$2x+180{,}000x^{-1}$

$0: 2-180{,}000x^{-2}$

$x^2 = 90{,}000$

$=300$

20 $P: 2x + 2y$



$S: 4x + 3y = 200$

$y = \frac{200 - 4x}{3} = \frac{200 - 100}{3} = \frac{100}{3}$

$2x\left(\frac{200 - 4x}{3}\right)$

$\frac{2}{3}\left(200x - 4x^2\right)$

$\frac{3}{2} \cdot \frac{2}{3}\left[200 - 8x\right] = 0 \cdot \frac{3}{2}$

$200 - 8x = 0$

$+8x \quad +8x$

$\frac{200}{8} = \frac{8x}{8}$

14. $P: \sqrt{(x-2)^2 + y^2}$

$S: y = \sqrt{x-8}$

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

$x^2 - 4x + 4 + x - 8$

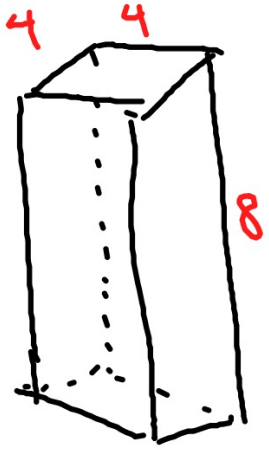
$x^2 - 3x - 4$

$2x - 3 = 0$

$x = 3\frac{1}{2}$

3.7C Area, Volume

A. $SA_{cube} = 6s^2$



$2x^2$ $4hx$

$SA = 2 \cdot 16 + 4 \cdot 8 \cdot 4$

$= 32 + 128$

$= 160$

Ex. Determine the dimensions of a rectangular solid (w/square base) with max volume if SA = 100

P: $x^2 \cdot h$

S: $100 = 2x^2 + 4xh$

$-2x^2$

$\frac{100 - 2x^2}{4x} = \frac{4xh}{4x}$

$x^2\left(\frac{100 - 2x^2}{4x}\right)$

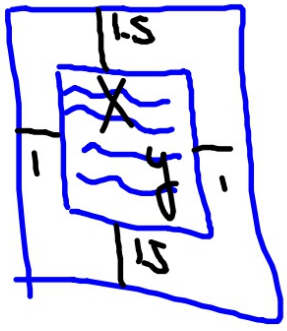
$\frac{100x - 2x^3}{4}$

$25x - \frac{1}{2}x^3$

$0 = 25 - \frac{3}{2}x^2$

$x = \sqrt{\frac{50}{3}}$

Ex. Say a page has 24 in^2 of print with 1.5 in top/bottom margins, 1 in L/R margins. How big is the page to use the smallest amount of paper?



$P:(x+2)(y+3)$

$\begin{cases} xy=24 \\ y=\frac{24}{x} \end{cases}$

$x=4$

$y=6$

$(x+2)\left(24x^{-1}+3\right)$

$24+3x+48x^{-1}+6$

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

$16=x^2$

$4=x$

P. 224 21, 22

29, 30

$0, 20 = 0$

$1, 19 = 19$

$2, 18 = 36$

$10, 10 = 100$

P: xy $x(20-x)$

S: $x+y=20$ $20x-x^2$

$-x \quad \cdot x$ $20 - 2x = 0$

$y = 20-x$ $20 = 2x$

$x = 10$