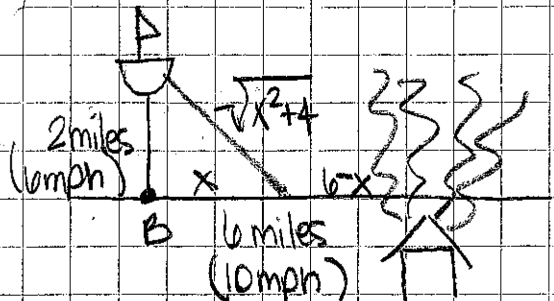
[redacted] cumulative practice



rate · time = distance

time = $\frac{\text{distance}}{\text{rate}}$

Time to house = Time rowing (T_1) + Time running (T_2)

primary

$TH = T_1 + T_2$

secondary

$T_1 = \frac{D_1}{R_1}$ $T_2 = \frac{D_2}{R_2}$

$TH = \frac{D_1}{R_1} + \frac{D_2}{R_2}$

$\frac{1}{3}+$

$TH = \frac{\sqrt{x^2+4}}{6} + \frac{6-x}{10}$

$TH = \frac{1}{6}\sqrt{x^2+4} + \frac{1}{10}(6-x)$

$x \geq 0 \quad x \leq 6$

$TH' = \frac{1}{6}\left(\frac{1}{2}(x^2+4)^{-1/2}(2x)\right) + \frac{1}{10}(-1)$

$TH' = \frac{x}{6\sqrt{x^2+4}} - \frac{1}{10}$

$0 = \frac{x}{6\sqrt{x^2+4}} - \frac{1}{10}$

$\frac{1}{10} = \frac{x}{6\sqrt{x^2+4}}$

$(6\sqrt{x^2+4})^2 = (10x)^2$

$36(x^2+4) = 100x^2$

$36x^2 + 144 = 100x^2$

$-64x^2 + 144 = 0$

$-64x^2 = -144$

$x^2 = \frac{144}{64}$

$x = \frac{12}{8}$ $\boxed{x = \frac{3}{2}}$

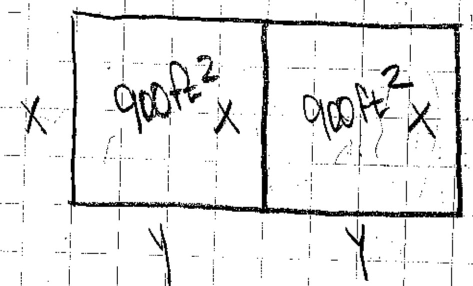
$TH(0) = \frac{1}{3} + \frac{3}{5} = \frac{14}{15}$

$TH(1.5) = .502 + .375 = .877$

$TH(6) = 1.054 + 0 = 1.054$

Time is at a minimum when x = 1.5. Henry should row to a point 1.5 miles from point B and run the rest of the way.

②



a) $P = 3x + 4y$ (amount of fence needed)

$A = xy \Longrightarrow 900 = xy$

$\frac{900}{y} = x$

$P = 3\left(\frac{900}{y}\right) + 4y$

$y > 0$

$P = \frac{2700}{y} + 4y$

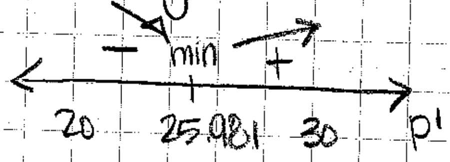
$P' = -\frac{2700}{y^2} + 4$

$0 = -\frac{2700}{y^2} + 4$

$\frac{-4y^2}{-4} = \frac{-2700}{-4}$

$y^2 = 675$

$y = 25.981$



$900 = xy$

$900 = x(25.981)$

$x = 34.641$

The least amount of fence will be used when the pens are 25.981 ft × 34.641 ft.

*

b) $Cost = (2x + 4y)3 + 2x$

$A = xy$

$900 = xy$

$\frac{900}{x} = y$

$Cost = 3\left(2x + 4\left(\frac{900}{x}\right)\right) + 2x$

$Cost = 6x + \frac{10800}{x} + 2x$

$Cost = 8x + \frac{10800}{x}$

$x > 0$

$C' = 8 + -\frac{10800}{x^2}$

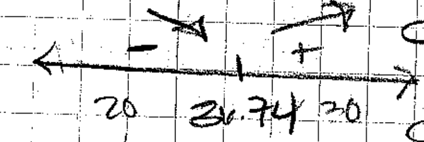
$0 = 8 - \frac{10800}{x^2}$

$-8 = -\frac{10800}{x^2}$

$-8x^2 = -10800$

$x^2 = 1350$

$x = 36.74$

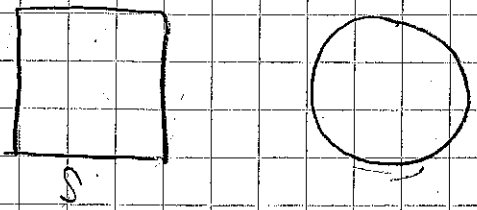


$900 = xy$

$900 = (36.74)(y)$

$y = 24.495$

$\boxed{\text{The lowest cost fence is produced when } x = 36.74 \text{ \& } y = 24.495.}$



$A = s^2 + \pi r^2$

$W = 4s + 2\pi r$

$16 = 4s + 2\pi r$

$\frac{16 - 2\pi r}{4} = s$

$\frac{8 - \pi r}{2} = s$

$A = \left(\frac{8-\pi r}{2}\right)^2 + \pi r^2$

$r > 0 \quad r < 16$

$A = \frac{64 - 16\pi r + \pi^2 r^2}{4} + \pi r^2$

$A' = \frac{1}{4}(-16\pi + 2\pi^2 r) + 2\pi r$

$A' = -4\pi + \frac{1}{2}\pi^2 r + 2\pi r$

$A' = -12.566 + 4.935r + 6.283r$

$A' = -12.566 + 11.218r$

$0 = -12.566 + 11.218r$

$12.566 = 11.218r$

$1.120 = r$

A min

$-$ $+$

A

A'

1 1.120 2

Circumference $= 2\pi r$

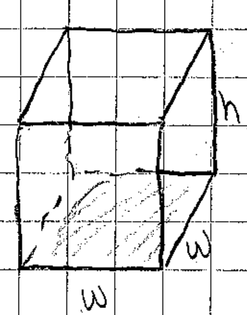
$= 2\pi(1.120)$

$= 7.038$

The cut should be made 7.038in from the end of the wire.

or 8.962 (from other end)

(4)



$V = w^2 h$

$SA = w^2 + 4wh$

$1000 = w^2 + 4wh$

$\frac{1000 - w^2}{4w} = h$

$V = w^2\left(\frac{1000-w^2}{4w}\right)$

$w > 0, \quad w < \sqrt{1000}$

$V = w\left(\frac{1000-w^2}{4}\right)$

$V = \frac{1000w - w^3}{4}$

$V' = \frac{1}{4}(1000 - 3w^2)$

$0 = \frac{1}{4}(1000 - 3w^2)$

$0 = 1000 - 3w^2$

$\frac{-1000}{-3} = \frac{-3w^2}{-3}$

$333.333 = w^2$

$18.257 = w$

max

$+$ $-$

V

V'

15 18.257 20

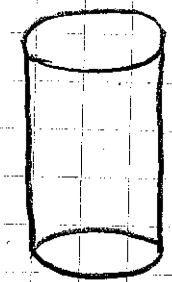
$w = 18.257$

$h = \frac{1000 - w^2}{4w}$

$h = 9.129$

The dimensions for maximum volume are 18.257 x 18.257 x 9.129

⑤



$SA = 2\pi r h + 2\pi r^2$

$V = \pi r^2 h$

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

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

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

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

$r > 0$

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

$SA' = -\frac{32\pi}{r^2} + 4\pi r$

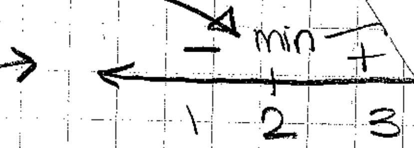
$0 = -\frac{32\pi}{r^2} + 4\pi r$

$\frac{32\pi}{r^2} = 4\pi r$

$32\pi = 4\pi r^3$

$8 = r^3$

$2 = r$

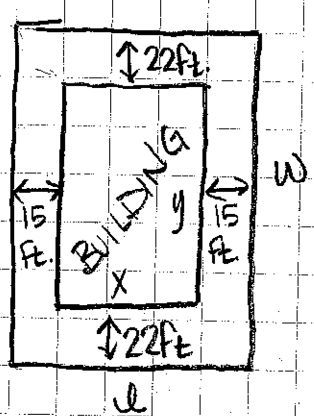


$r = 2$

$h = \frac{16}{4} = 4$

The dimensions that minimize the amount of material needed are $r = 2$ in and $h = 4$ in.

⑥



$A_{lot} = w \cdot l$

$w = x + 30 \quad l = y + 44 \qquad xy = 13200$

$y = \frac{13200}{x}$

$A_{lot} = (x+30)(y+44)$

$A_{lot} = (x+30)\left(\frac{13200}{x} + 44\right)$

$A_{lot} = 13200 + 44x + \frac{396000}{x} + 1320$

$x > 0 \quad x \leq \sqrt{13200}$

$A_{lot} = 14520 + 44x + \frac{396000}{x}$

$A' = 44 - \frac{396000}{x^2}$

continued

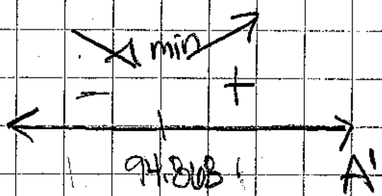
$$0 = 44 - \frac{396000}{x^2}$$

$$\frac{396000}{x^2} = 44$$

$$\frac{39600}{44} = \frac{44x^2}{44}$$

$$9000 = x^2$$

$$94.868 = x$$



$x = 94.868 + 30 \Rightarrow w = 124.868$

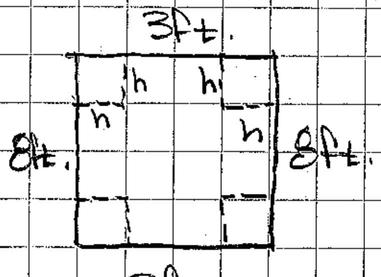
$xy = 13200$

$y = \frac{13200}{124.868}$

$y = 139.141 + 44 = 183.141$

The smallest lot on which the building can be located is 124.868 x 183.141

7.



$V = l \cdot w \cdot h$

$l = 8 - 2h \quad w = 3 - 2h$

$V = (8-2h)(3-2h)h$

$V = (24 - 16h - 6h + 4h^2)h$

$V = 24h - 22h^2 + 4h^3$

$h > 0 \quad h < 3$

$V' = 24 - 44h + 12h^2$

$0 = 12h^2 - 44h + 24$

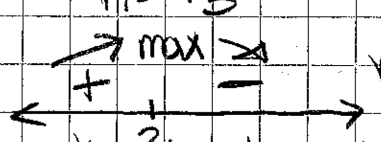
$h = 3, \frac{2}{3}$ → QUAD FORM PROGRAM — CALCULATOR

$h = \frac{2}{3}$

$h = \frac{2}{3}$

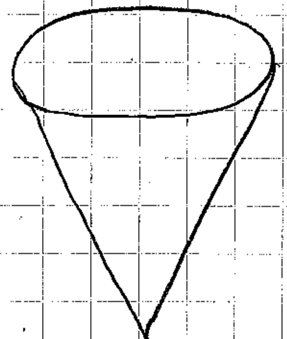
$l = 8 - 2(\frac{2}{3}) = 6.667$

$w = 3 - 2(\frac{2}{3}) = 1.667$



The dimensions that yeild the maximum volume are 6.667 ft x 1.667 ft x 2/3 ft.

8



$V = 10\,cm^3 \qquad SA = \pi r\sqrt{r^2+h^2} + \pi r^2$

$$V = \tfrac{1}{3}\pi r^2 h$$
$$10 = \tfrac{1}{3}\pi r^2 h$$
$$30 = \pi r^2 h$$
$$\frac{30}{\pi r^2} = h$$

$$SA = \pi r\sqrt{r^2 + \left(\frac{30}{\pi r^2}\right)^2} + \pi r^2$$
$$SA = \pi r\sqrt{r^2 + \frac{900}{\pi^2 r^4}} + \pi r^2$$

$$r > 0$$

$$SA = \pi r\left(r^2 + \frac{900}{\pi^2 r^4}\right)^{1/2} + \pi r^2$$

$$SA' = \pi r^2 \cdot \frac{1}{2}\left(r^2+\frac{900}{\pi^2 r^4}\right)^{-1/2} \cdot \left(2r + \frac{-2700}{\pi^2 r^5}\right) + \left(r^2+\frac{900}{\pi^2 r^4}\right)^{1/2} \cdot \pi + 2\pi r$$

$$SA' = \frac{\pi r^2}{\cancel{2}}\left(\frac{\left(\cancel{2}r - \frac{2700}{\pi^2 r^5}\right)}{\sqrt{r^2+\frac{900}{\pi^2 r^4}}}\right) + \pi\sqrt{\frac{r^2+900}{\pi^2 r^4}} + 2\pi r$$

$$= \frac{\pi r^3 - \frac{1350}{\pi r^3}}{\sqrt{r^2+\frac{900}{\pi^2 r^4}}} + \frac{\cancel{\pi}\sqrt{r^2+900}}{\cancel{\pi} r^2} + 2\pi r$$

$$=$$