1. 

Glass brick

$Cost = 3x + 2y + x = 4x + 2y$

$= 4x + 400/x$

$xy = 200$

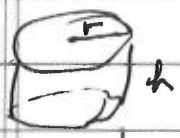
$y = 200/x$

$C' = 4 - 400/x^2 = 0$

$4 = 400/x^2 \quad x^2 = 100 \quad x = 10 \quad y = 20$

$C'' = +\frac{800}{x^3}$ so minimum.

Cost will be minimum if the side along Lake Fred is 10 ft and the perpendicular side is 20.

2. 

$V = \pi r^2 h = 100$

$h = 100/\pi r^2$

$Cost = 2(2\pi r^2) + 5(2\pi r h)$

$= 4\pi r^2 + 10\pi r h$

$= 4\pi r^2 + 1000/r$

$C'(1) = 8\pi - 1000 < 0$

$C'(10) = 80\pi - 100 > 0$

dec/inc

∴ min

$h = 100/\pi\left(\frac{25}{\sqrt[3]{\pi^2}}\right) = 4/\sqrt[3]{\pi}$

$C' = 8\pi r - 1000/r^2 = 0$

$\Rightarrow 8\pi r^3 = 1000$

$r^3 = \frac{1000}{8\pi} \quad r = \frac{5}{\sqrt[3]{\pi}}$

$h \approx 2.73 \quad r \approx 3.41$

The can should be $4/\sqrt[3]{\pi}$" tall with radius $5/\sqrt[3]{\pi}$

3. Yield per tree (YPT) = 500 − 5(# trees over 60)

Let x = # trees $\quad YPT = 500 - 5(x - 60)$

Yield/acre $= x(500 - 5(x - 60))$

$= 500x - 5x^2 + 300x = 800x - 5x^2$

$Y' = 800 - 10x = 0$ when $x = 80$

$Y'' = -10$ so CP is a max.

They should plant 80 trees per acre to maximize yield.