

§8-3 #3,2

3. Let x = width of rectangular field
" " " " " "

$2x$ = length "

y = side length of square field

Note: Since $\text{perim}_{\text{rect.}} + \text{perim}_{\text{sq.}} = 600$ (given), we know

$$6x + 4y = 600$$

$$4y = 600 - 6x$$

$$y = 150 - 1.5x$$

Area constraints:
$$\begin{cases} y^2 = (150 - 1.5x)^2 \geq 100 \\ 2x \cdot x = 2x^2 \geq 800 \end{cases}$$

(a) $y^2 = (150 - 1.5x)^2 \geq 100$

Since $y > 0$ [it's a side length, remember],

$$150 - 1.5x \geq 10$$

$$-1.5x \geq -140$$

$$x \leq \frac{140}{1.5} = 93.\bar{3}$$

Also, $2x^2 \geq 800$ from above

$$\Rightarrow x^2 \geq 400$$

$$x \geq 20 \text{ or } x \leq -20$$

$$\therefore D_x = [20, 93.\bar{3}]$$

(b) [Objective function]

$$\text{Total area} = A(x) = y^2 + 2x^2$$

$$A(x) = (150 - 1.5x)^2 + 2x^2$$

