HW 3.7A

1) Prim: $P = xy$ $\quad P = (50+y)y$ $\quad 50+2y=0$

Sec: $x - y = 50$ $\quad = 50y + y^2$ $\quad 2y = -50$

$x = 50 + y$ $\quad P' = 50 + 2y$ $\quad y = -25$

$P'(-26)$ $-\searrow$ $\quad P'(-24)$ $+\nearrow$ min

$x = 50 - 25$ $\quad \boxed{x = 25 \quad y = -25}$

2) Prim: $S = x + y$ $\quad S = \frac{192}{y} + y$ $\quad -\frac{192}{y^2} + 1 = 0$

Sec: $xy = 192$ $\quad = 192y^{-1} + y$ $\quad 1 = \frac{192}{y^2}$

$x = \frac{192}{y}$ $\quad S' = -\frac{192}{y^2} + 1$ $\quad y^2 = 192$

Domain $x > 0$ $\quad y = \pm\sqrt{192} \approx 13.856$

$y > 0$ $\quad x = \frac{192}{\sqrt{192}}$ $\quad S'(10)$ $-\searrow$ $\quad S'(15)$ $+\nearrow$ min.

≈ 13.856 $\quad \boxed{x \approx 13.856}$

$\boxed{y \approx 13.856}$

3)

Prim: $A = \ell w$ $\quad A = (100 - \frac{3}{2}w)w$ $\quad 100 - 3w = 0$

Sec: $2\ell + 3w = 200$ $\quad = 100w - \frac{3}{2}w^2$ $\quad 3w = 100$

Domi $0 < x < 200$ $\quad 2\ell = 200 - 3w$ $\quad A' = 100 - 3w$ $\quad w = \frac{100}{3} \approx 33.333$

$\ell = 100 - \frac{3}{2}w$ $\quad A'(33)$ $+\nearrow$ $\quad A'(34)$ $-\searrow$ Max

$100 - \frac{3}{2}(\frac{100}{3})$ $\quad \boxed{\ell = 50 ft \quad w = 33.\bar{3} ft}$

$100 - 50$

4) $R = 600x^2 - 0.1x^3$ $\quad R' = 1200x - 0.3x^2$ $\quad 1200x - 0.3x^2 = 0$

$x(1200 - 0.3x) = 0$

$x = 0$ $\quad x = 4000$

$R'(-1)$ $-\searrow$ $\quad R'(1)$ $+\nearrow$ $\quad R'(3000)$ $+\nearrow$ $\quad R'(5000)$ $-\searrow$

min $\quad$ Max

$\boxed{4{,}000 \text{ units produces maximum revenue}}$

5) Prim: $A = \ell w$ $\quad A = (25 - w)(w)$ $\quad 25 - 2w = 0$

Sec: $P = 2\ell + 2w = 50$ $\quad = 25w - w^2$ $\quad 2w = 25$

$2\ell = 50 - 2w$ $\quad A' = 25 - 2w$ $\quad w = 12.5$

$\ell = 25 - w$ $\quad A'(10)$ $+\nearrow$ $\quad A'(13)$ $-\searrow$

Max

$\boxed{\ell = 12.5 ft}$

$\boxed{w = 12.5 ft}$