

## 2C. Max-min problems

1)

$$L = 12 - 2x$$

$$V = x(12 - 2x)^2$$

$$0 = x(12 - 2x)^2 \Rightarrow x = 2,6$$

$$\boxed{x = 2}$$

2)

$$A = xy = 20000$$

$$y = \frac{20000}{x}$$

$$L = 2x + y = 2x + \frac{20000}{x}$$

$$\frac{dL}{dx} = 2 - \frac{20000}{x^2}$$

$$0 = 2 - \frac{20000}{x^2} \Rightarrow x = \sqrt{10000} = 100$$

$$\boxed{200 + y}$$

4)

$$108 = x + 4y$$

$$x = 108 - 4y$$

$$V = 2xy^2 = 2y^2(108 - 4y)$$

$$\frac{dV}{dy} = 0 \Rightarrow y = \{0, 18\}$$

$$y = 18 \Rightarrow x = 36 \Rightarrow V = 23328 \text{ in}^3 \left( \frac{1 \text{ ft}^3}{12^3 \text{ in}^3} \right) = \boxed{13.5 \text{ ft}^3}$$

10)

?

13a)

$$R = np$$

$$\underbrace{R}_{20090} = \underbrace{n}_{98} \underbrace{p}_{205}$$

$$20000 = 100(200)$$

$$19890 = 102(195)$$

$$n = 100 + \frac{2}{5}(200 - p)$$

$$R = p \left( 100 + \frac{2}{5}(200 - p) \right)$$

$$R' = 0 \Rightarrow \boxed{p = 225}$$

13b)

$$Y = 10^5 \left( 10 - \frac{p}{2} \right) p - \left( 10 - \frac{x}{10^5} \right) x$$

$$x = 10^5 \left( 10 - \frac{p}{2} \right)$$

$$Y = 10^5 \left( 10 - \frac{p}{2} \right) p - 10^5 \left( 10 - \frac{p}{2} \right) \left( 10 - \frac{10^5 \left( 10 - \frac{p}{2} \right)}{10^5} \right) = 10^5 \left( 10 - \frac{p}{2} \right) \left( p - 10 + 10 - \frac{p}{2} \right) = 10^5 \left( 10 - \frac{p}{2} \right) \frac{p}{2}$$

$$Y' = 0 \Rightarrow \boxed{p = 10}$$