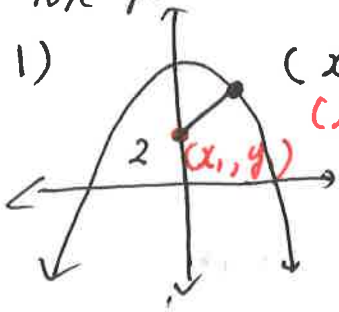
More practice WS. Solutions. ①

1)




2) $d = \sqrt{(x_1-x_2)^2 + (y_1-y_2)^2}$

$d = \sqrt{(0-x)^2 + (2-(4-x^2))^2}$

$d = \sqrt{x^2 + (x^2-2)^2}$

$d = \sqrt{x^4 - 3x^2 + 4} \Leftrightarrow d^2 = x^4 - 3x^2 + 4$

3) $\frac{dd}{dx} = 0$ Solve for x.

$\Rightarrow \frac{d\,d^2}{dx} = 0$ 〃

$\frac{d\,d^2}{dx} = 4x^3 - 6x = 0$

$= 2x(2x^2-3) = 0$

$x = 0, \quad x = \pm\sqrt{\frac{3}{2}}$.

4) Check. $\Rightarrow \frac{d^2 d^2}{(dx)^2} = 12x^2 - 6$.

$\therefore \boxed{\left(\pm\sqrt{\frac{3}{2}}, \frac{5}{2}\right)}$

$\left.\frac{d^2 d^2}{(dx)^2}\right|_{x=0} = -6 < 0$ ∩ Max value.

$4 - \left(\frac{3}{2}\right)$

$\frac{8}{2} - \frac{3}{2} = \frac{5}{2}$

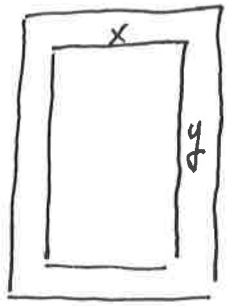
$\left.\frac{d^2 d^2}{(dx)^2}\right|_{x=-\sqrt{\frac{3}{2}}} \Rightarrow 12\left(-\sqrt{\frac{3}{2}}\right)^2 - 6 > 0$ ∪ Min value.

$\left.\frac{d^2 d^2}{(dx)^2}\right|_{x=\sqrt{\frac{3}{2}}} = 12\left(\sqrt{\frac{3}{2}}\right)^2 - 6 > 0$ ∪ Min value.

# 2.



1)




$x \cdot y = 24.$

$y = \frac{24}{x}$

2) $A_{paper} = (x+2)(\frac{24}{x}+3)$

$= 3x + \frac{48}{x} + 30$

3) $\frac{dA}{dx} = 0$ Solve for $x$

$\frac{dA}{dx} = 3 - \frac{48}{x^2} \Rightarrow x = \cancel{\pm} 4$

$x = 4$

$= 3 - 48(x^{-2})$

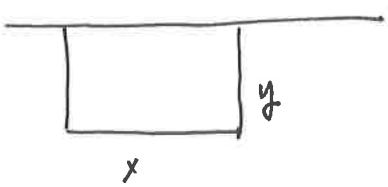
4) $\frac{d^2A}{dx^2} = \frac{(48)(2)}{x^3}$

$\left.\frac{d^2A}{dx^2}\right|_{x=4} = \frac{48(2)}{(4)^3} > 0$ $\cup$ Min Value.

$\therefore$ 6" by 9"

# 3.

1)




2) $A = x \cdot y = 180{,}000 \Rightarrow y = \frac{180{,}000}{x}$

$P = 2y + x$

$= \frac{360{,}000}{x} + x$

3) $\frac{dP}{dx} = 0$ Solve for $x$

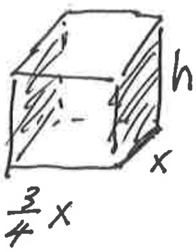
$\frac{dP}{dx} = \frac{-360{,}000}{x^2} + 1 \Rightarrow \boxed{x = 600}$

4) $\frac{d^2P}{dx^2} = \frac{(2)(360{,}000)}{x^3}$

$\therefore$ 600m by 300m

$\left.\frac{d^2P}{dx^2}\right|_{x=600} = \frac{(2)(360{,}000)}{(6000)^3} > 0$ $\cup$ Min

#4. 1)




2)

$$V = \left(\tfrac{3}{4}x\right)\cdot x \cdot h = 900\ ft^3 \Rightarrow h = \frac{900}{\frac{3}{4}x^2} = \frac{\cancel{900}^{300}}{x^2}\left(\frac{4}{\cancel{3}}\right) = \frac{1200}{x^2}$$

③

$$\text{Cost} = (\$4)(x)\left(\tfrac{3}{\cancel{4}}x\right) + (\$6)(2)(x\cdot h) + (\$3)(x)\left(\tfrac{3}{4}x\right)$$

$$+ (\$6)(\cancel{2})^{12\ 3}\left(\tfrac{3}{\cancel{4}}x\cdot h\right)$$

$$C = \frac{\cancel{3}^{12}x^2}{4} + 12xh + 9xh + \frac{9}{4}x^2$$

$$C = \frac{21}{4}x^2 + 21xh$$

$$= \frac{21}{4}x^2 + 21\cancel{x}\left(\frac{1200}{\cancel{x^2}}\right) = \frac{21}{4}x^2 + \frac{25200}{x}.$$

3) $\frac{dc}{dx} = 0$ solve for $x$. $\quad \frac{21x}{2} - 25200x^{-2}$

$$\frac{dc}{dx} = \frac{21\cdot\cancel{2}}{\cancel{4}\,2}x - \frac{25200}{x^2} = 0$$

$$\Rightarrow \frac{21x}{2} = \frac{25200}{x^2} \Rightarrow 21x^3 = (2)(25200).$$

$$x = \sqrt[3]{\frac{(2)(25200)}{21}} \approx 13.4 \text{ feet}.$$

4) check. $\frac{d^2C}{dx^2} = \frac{21}{2} + (2)(25200)\cdot x^{-3}$

$$\left.\frac{d^2C}{dx^2}\right|_{x=13.4} > 0 \quad \text{Min Value.}$$

$$\therefore\ \underbrace{(13.4)'}_{W.} \times \underbrace{\left(\tfrac{3}{4}\right)(13.4)'}_{L.} \times \underbrace{\left(\frac{900}{\left(\frac{3}{4}\right)(13.4)^2}\right)'}_{H.}$$