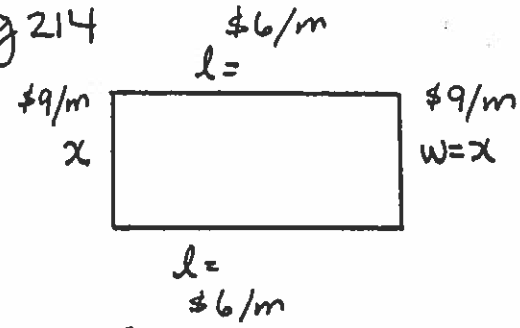
pg 214

#5.




Total Cost = $9000

$\$6 \cdot 2l + \$9 \times 2x = \$9000$

$12l + 18x = 9000$

$12l = 9000 - 18x$

$l = 750 - 1.5x$

maximize area, A, in $m^2$

$A = lw$

$A = (750 - 1.5x)(x)$

$A = -1.5x^2 + 750x$

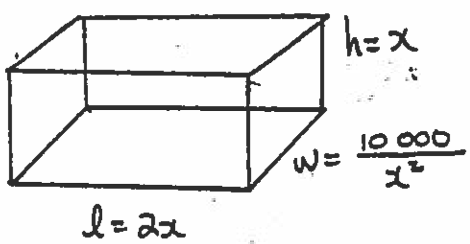
$\frac{dA}{dx} = ?$

For max area

$\frac{dA}{dx} = 0$

---

#6.




Find w in terms of x

$V = 20\,000\ m^3$

$2x \cdot x \cdot w = 20\,000$

$w = \frac{10\,000}{x^2}$

minimize cost, C, in $

$C = 40A_{base} + 100 \times A_{\text{side walls}} + 200A_{top}$

$C = 40(2x)\left(\frac{10\,000}{x^2}\right) + 100\left[2(2x)(x) + 2x\left(\frac{10\,000}{x^2}\right)\right] + 200(2x)$

$C = \frac{800\,000}{x} + 100\left(4x^2 + \frac{20\,000}{x}\right) + \frac{4\,000\,000}{x}$

$C = \frac{800\,000}{x} + 400x^2 + \frac{2\,000\,000}{x} + \frac{4\,000\,000}{x}$

$C = 400x^2 + \frac{6\,800\,000}{x}$

$C = 400x^2 + 6\,800\,000x^{-1}$

$\frac{dC}{dx} = ?$

For min. cost

$\frac{dC}{dx} = 0$

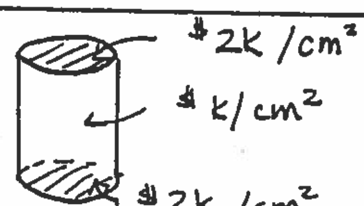
Note: for restrictions

$1 \leq x$

| $x$ | C |
|---|---|
| 1 | |
| ? | |
| 2x | |

---

#7.




Find h in terms of r

$V = 1000\ cm^3$

$\pi r^2 h = 1000$

$h = \frac{1000}{\pi r^2}$

minimize cost, C in $

$C = 2k \cdot A_{\text{top \& bottom}} + k \cdot A_{sides}$

$C = 2k \cdot 2\pi r^2 + k \cdot 2\pi r h$

$C = 4\pi k r^2 + 2\pi k r h$

$C = 4\pi k r^2 + 2\pi k r \cdot \frac{1000}{\pi r^2}$

$C = 4\pi k r^2 + 2000kr^{-1}$

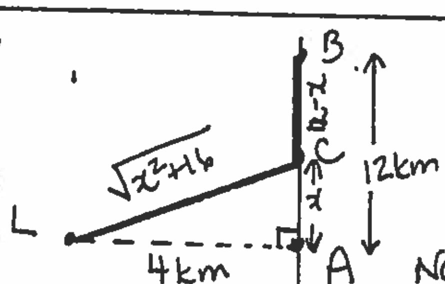
$\frac{dC}{dr} = ?$

For min cost

$\frac{dC}{dr} = 0$

---

#8.




Note: $0 \leq x \leq 12$

| $x$ | C |
|---|---|
| 0 | |
| ? | |
| 12 | |

minimize cost, C in $

$C = C_{\text{cable underwater}} + C_{\text{cable on land}}$

$C = 6000\sqrt{x^2+16} + 2000(12 - x)$

$C = 6000(x^2+16)^{\frac{1}{2}} + 24\,000 - 2000x$

$\frac{dC}{dx} = ?$

For min cost

$\frac{dC}{dx} = 0$

9. Let $x$ represent the number of increases in fare of \$0.50.

Maximize the revenue, $R$ in \$

Revenue = Number of people × fare

$$R = (10\,000 - 200x)(20 + 0.5x)$$

$$R = -100x^2 + 1000x + 200\,000$$

$$\frac{dR}{dx} = ?$$

For max. revenue

$$\frac{dR}{dx} = 0$$

Restrictions:

$10\,000 - 200x = 15\,000$

$-200x = 5000$

$x = -25$

$R = 130\,000$

$00x^2 + 1000x + 200\,000 = 130\,000$

$\cdot 100x^2 + 1000x + 70\,000 = 0$

$x^2 - 10x - 700 = 0$

$a = 1 \quad b = -10 \quad c = -700$

$x = \frac{-(-10) \pm \sqrt{(-10)^2 - 4(1)(-700)}}{2(1)}$

$= \frac{+10 \pm \sqrt{3300}}{2}$

$x = -23.7$ or $x = +33.7$

Note: $-25 \le x \le 23.7$

| $x$ | $R$ |
|---|---|
| $-25$ | |
| ? | |
| $23.7$ | |

#10. Let $v$ knots represent the speed of the ship

Let \$$C$ represent the fuel cost per hour for running a ship.

minimize, $C$ in \$

$$C = \frac{1}{2}v^3 + 216 \times \frac{500}{v}$$ # of hours

$$\frac{dC}{dv} = ?$$

For minimum cost

$$\frac{dC}{dv} = 0$$

12. Let $x$ represent the number of \$0.50 increases in price.

maximize weekly profit $P$ in \$

a) Profit = Profit per cake × Number of cakes

$$P = (4 + 0.5x)(200 - 7x)$$

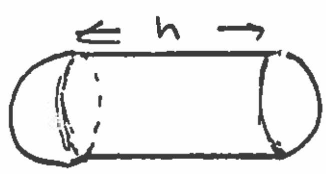
$$P = -3.5x^2 + 72x + 800$$

$$\frac{dP}{dx} = ?$$

For max. profit

$$\frac{dP}{dx} = 0$$

14.




Find

$V = 200\text{ m}^3$

$\frac{4}{3}\pi r^3 + \pi r^2 h = 200$

$4\pi r^3 + 3\pi r^2 h = 600$

$3\pi r^2 h = 600 - 4\pi r^3$

$h = \frac{600 - 4\pi r^3}{3\pi r^2}$

Restrictions:

$h + 2r \le 16$

$\frac{600 - 4\pi r^3}{3\pi r^2} + 2r \le 16$

minimize the cost, $C$ in \$

$$C = 2k A_{hemispheres} + k A_{cylinder}$$

$$C = 2k \cdot 4\pi r^2 + k \cdot 2\pi r h$$

$$C = 8\pi k r^2 + 2\pi k r\left(\frac{600 - 4\pi r^3}{3\pi r^2}\right)$$

$$C = 8\pi k r^2 + 400 k r^{-1} - \frac{8\pi k r^2}{3}$$

$$C = \frac{16}{3}\pi k r^2 + 400 k r^{-1}$$

$$\frac{dC}{dr} = ?$$

For min cost

$$\frac{dC}{dr} = 0$$

$r = ?$

check