

Revision Exercise (Differentiation II)

1.

a) 8 units s^{-1}

d) $20 \text{ cm}^2\text{s}^{-1}$

b) 2 ms^{-1}

e) 83.33 ms^{-1}

c) $\frac{3}{4} \text{ cms}^{-1}$

2.

a) $5\pi \text{ cms}^{-1}$

c) $0.4\pi \text{ m}^2\text{s}^{-1}$

b) 2 ms^{-1}

d) $\frac{4}{5\pi} \text{ ms}^{-1}$

3.

a) $8\pi \text{ cm}^2\text{s}^{-1}$

b) $400\pi^2 \text{ m}^3\text{s}^{-1}$

c) $\frac{25}{144\pi} \text{ cms}^{-1}$

d) $\frac{5}{16\pi} \text{ mms}^{-1}$

4.

a) $\frac{2}{5\pi} \text{ cms}^{-1}$

b) $50000\pi \text{ cm}^3\text{s}^{-1}$

5. $P = 2r + r\theta \Rightarrow r = \frac{P}{2+\theta}$

$$A = \frac{1}{2} \left(\frac{P}{2+\theta} \right)^2 \theta$$

$$\frac{dA}{d\theta} = \frac{P^2(2-\theta)}{2(2+\theta)^3}$$

$$\frac{dA}{d\theta} = 0 \Rightarrow \frac{P^2(2-\theta)}{2(2+\theta)^3} = 0 \Rightarrow \theta = 2$$

$$\frac{d^2A}{d\theta^2} = \frac{P^2(\theta-4)}{(2+\theta)^4} < 0 \text{ when } \theta = 2.$$

$\therefore A$ attains a maximum when $\theta = 2$ radians.

6. $\frac{2}{\pi} \text{ cms}^{-1}$

7.

(i) 393.11 cm^2

(ii) 438.60 cm^2

(iii) 459.79 cm^2

8.

(i) 1030.24 cm^2

(ii) 1090.27 cm^2

(iii) 1149.46 cm^2