

Question 6

a/ (i) $a = -1$ ~~$n = 60$~~ $d = 5$

$$T_{60} = -1 + 59(5)$$

$$\therefore T_{60} = 294$$

(ii) $a = -1$ $n = 60$ $l = 294$

$$S_{60} = 30(-1 + 294)$$

$$= 8790$$

\therefore The sum of the first 60 terms is ~~8790~~ 8790

b/ $e^x = 1.23$

$$x \ln e^1 = \ln 1.23$$

$$\therefore x = 0.207 \text{ (3dp)}$$

c/ A and B are turning points, $\Rightarrow \frac{dy}{dx} = 0$

(i) $\frac{dy}{dx} = 3x^2 + 2x - 1$

$$3x^2 + 2x - 1 = 0 \quad x - 3$$

$$(3x + 1)(3x - 1) = 0 \quad + 2$$

$3x$

$$\therefore x = -1 \quad x = \frac{1}{3}$$



(i) continued...

$$x = -1, x = \frac{1}{3}$$

$$\text{when } x = -1 \quad y = -1 + 1 + 1 + 2 \\ = 3$$

$$\text{when } x = \frac{1}{3} \quad y = \frac{1}{27} + \frac{1}{9} - \frac{1}{3} + 2 \\ = \frac{122}{27}$$

NATURE $\Rightarrow \frac{d^2y}{dx^2}$

$$\frac{d^2y}{dx^2} = 6x + 2$$

when $x = -1$ $\frac{d^2y}{dx^2} = -4 < 0 \therefore$ maximum.

when $x = \frac{1}{3}$ $\frac{d^2y}{dx^2} = 4 > 0 \therefore$ minimum

\therefore A is $(-1, 3)$ and B is $(\frac{1}{3}, \frac{122}{27})$

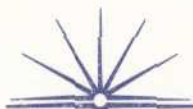
(ii) P.O.I $\Rightarrow \frac{d^2y}{dx^2} = 0$

$$6x + 2 = 0$$

$$x = -\frac{1}{3}$$

for $x \geq -\frac{1}{3}$ the curve is concave up.

$x = -\frac{1}{3}$ is a point of inflexion where concavity changes from a negative to positive.



(iii) ~~$x^3 + x^2 + x + 2 = k$~~

$$x^3 + x^2 - x + 2 = k$$

3 real solutions \Rightarrow 3 x-intercepts.