Quest ⑥.

a). AP.

$d = 5.$

$T_n = 60.$

$a = -1$

i). $T_n = a + (n-1) d.$

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

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

$= -1 + 295$

$T_{60} = 294.$

ii). $S_n = \frac{n}{2} (2a + (n-1) d).$

$S_{60} = \frac{60}{2} ((2 \times -1) + (60-1) 5)$

$= 30 (-2 + 295)$

$S_{60} = 8790.$

b). Using $P = 100 (1.23)^t$ find t.

$$\frac{P}{100} = 1.23^t$$

$$\ln \frac{P}{100} = \ln 1.23 t \qquad ??$$

c). $y = \frac{1}{3}x^3 + x^2 - x + 2$.

i). To find turning points AB
use y' and set to 0

$$y' = 3x^2 + 2x - 1$$
$$0 = 3x^2 - 2x - 1.$$
$$= \frac{(3x - 3)(3x + 1)}{3}$$
$$= (x - 1)(3x + 1)$$
$$x = 1, -1.$$

To find y sub into original.

When $x = 1$

$$y = (1)^3 + (1)^2 - 1 + 2.$$

$$y = 2 - 1 + 2.$$

$$y = 3.$$

when $x = -1$

$$y = (-1)^3 + (-1)^2 - 1 + 2.$$

$$y = -1 + 1 - 1 + 2.$$

$$y = 1.$$

The Co-ordinates.

$$A = (-1, 1) \leftarrow \text{this can't be}$$
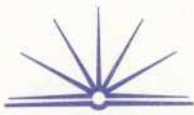
$$B = (1, 3) \qquad \text{but I can't}$$

$$\text{find an error.}$$

ii). x is concave up when $y'' (x) > 0$
or minimum
or ~~maximum~~.

$$y'' = 6x + 2.$$

when $y' = -1$ $y'' = 6(-1) + 2 < 0$ ∴

max

$\downarrow$

when $y' = 1$ $y'' = 6(1) + 2 > 0$ $\therefore$

minimum.

minimum turning point at B.
when $x = 1$.

iii) $x^3 - x^2 - x + 2 = k$.

$k = 8, 12, 4$.