Q6

a) $-1 + 4 + 9$

i) $a = -1 \quad d = 5$

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

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

$= -1 + 59 \times 5$

$T_{60} = 294$

ii) $S_n = \frac{n}{2}\left[2a + (n-1)d\right]$

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

$= 30\left(-2 + 295\right)$

$= 8790$

b) $P = 100(1.23)^t \qquad P = 100e^{\alpha t}$

$100(1.23)^t = 100(e^{\alpha})^t$

$e^{\alpha} = 1.23$

$\alpha \ln e = \ln 1.23$

$\alpha = \ln(1.23)$

$= 0.207 \quad (3 \text{ dp})$

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c) i) $y = x^3 + x^2 - x + 2$

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

when $\frac{dy}{dx} = 0 \Rightarrow$ turn pt.

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

~~$(3x\ 2)(x\ 1) = 0$~~

$(3x - 1)(x + 1) = 0$

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

$y = 3, \frac{49}{27}$

A $(-1, 3)$ B $(\frac{1}{3}, \frac{49}{27})$

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

when $\frac{d^2y}{dx^2} = 0 \Rightarrow$ pt of inflection

$6x + 2 = 0$

$6x = -2$

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

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

because that is where pt of inflection occurs

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

$x^3 + x^2 - x + 2 = \frac{49}{27}$

when $k > \frac{49}{27}$

$k < 3$

$\frac{49}{27} < k < 3$