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(a) (i)

$$A_n = P\left(1+\frac{r}{100}\right)^n$$

$$A_1 = 500\left(1+\frac{1}{200}\right)^{240}$$

$$A_2 = 500(1.005)^{239}$$

$$A_3 = 500(1.005)^{238}$$

$$\therefore A_{240} = 500(1.005)^1$$

$\therefore$ Total $A =$

$$500(1.005^1 + 1.005^2 + \ldots 1.005^{240})$$

$\therefore$ Geo series

$$S_n = \frac{a(r^n-1)}{r-1}$$

$$= \frac{1.005(1.005^{240}-1)}{1.005-1} \times 500$$

$$= 232,175.55 \text{ (2dp)}$$

(ii) (1)

$$A_1 = \left(1+\frac{1}{200}\right)^1 - M$$

$$= \overset{232175.55}{P}(1+.005) - 2000$$

$$A_2 = \overset{A_1}{P} \times (1.005) - 2000$$

$$= [P(1.005) - 2000] \times (1.005) - 2000$$

$$\cancel{= 1.005^2 - (1.005+1)}$$

$$= \{1.005^2 - 2000 \times 1.005\} - 2000$$

$$= \overset{232175.55}{P}1.005^2 - 2000(1.005+1)$$

$$A_3 = A_2 \times (1.005) - 2000$$

$$= [P\,1.005^2 - 2000(1.005+1)] \times (1.005) - 2000$$

$$= \overset{232175.55}{P}1.005^3 - 2000(1.005^2 + 1.005 + 1)$$

$$=$$

$$A_2 = A_1 \times (1.005) - M$$

$$= [(1.005) - 2000] \times 1.005 - M$$

$$= 1.005^2 (1.005+1)2000 - M$$

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$\therefore$ ~~$A_n = 1.005^n - 2000(1.005^{n-1} + \ldots 1)$~~

$\therefore A_3 = P(1.005^3) - 20000)(1.005^2 + 1.005 + 1)$

$\therefore A_n = P(1.005^n) - 20000((1.005^{n-1} \ldots + 1)$

$\therefore A_n = (P - 400,000) \times 1.005^n + 400\,000$

(2) $A_n = (P - 400000) \times 1.005^n + 400000$

When $A_n = 0$

~~$(P - 400000) \times 1.005^n = -400000$~~

~~$1.005^n = \frac{-400000}{(P - 400000)}$~~

$0 = (P - 400000) \times 1.005^n + 400000$

$-400000 = (P - 400000) \times 1.005^n$

$\frac{-400000}{(P - 400000)} = 1.005^n$

(b) (i) $f(x)$ is increasing when $f'(x) > 0$

$\therefore$ ~~$f(x)$ is increasing~~ for

~~$0 \le f(x) < 2$~~ $0 < x < 2$ curve

~~$0 \le x \le 2$~~ is increasing

(ii) When $f'(x) = 0$, stat point

$\therefore$ when $x = 2$, max value of $f(x)$

(as $f'(x) > 0$ prior and $f'(x) < 0$ after)

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(iii) $f(0) = 0$ $f'(6) = -3$

$f(6)$ $\therefore$ when $x = 6$, curve is decreasing

$\therefore f(6) = -2$

(iv)