

MATHEMATICS
GRADE 12
PRELIM PAPER 1
13 July 2017

SECTION A

[75]

QUESTION 1

(a) ① $\frac{3}{x-2} = x-4$

$\times (x-2)$ ✓
 $x \neq 2$

$$3 = x^2 - 6x + 8$$

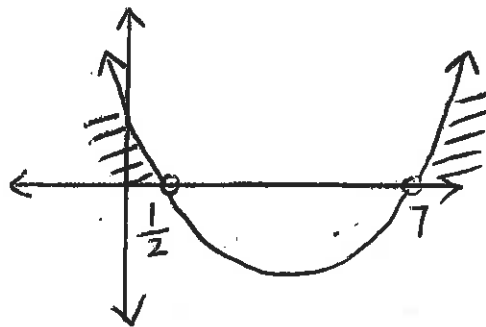
$$0 = x^2 - 6x + 5$$

$$0 = (x-1)(x-5)$$

$$x = 1 \text{ or } x = 5$$

(4)

② $(2x-1)(x-7) > 0$



✓
 $x \in (-\infty, \frac{1}{2}) \text{ or } (7, \infty)$
OR: $x < \frac{1}{2} \text{ or } x > 7$

(3)

③ $(\sqrt{5x+6})^2 = (-2x)^2$ ✓

$$5x+6 = 4x^2$$

$$0 = 4x^2 - 5x - 6$$

$$0 = (4x+3)(x-2)$$
 ✓

$$x = -\frac{3}{4} \text{ or } x = 2$$
 ✓

N.A.

(4)

①

$$(b) \quad 5^{x-k} + 2(5^{x-k}) = 15(5^{k^2})$$

$$3(5^{x-k}) \checkmark = 15(5^{k^2})$$

$$\div 3: \quad 5^{x-k} = 5(5^{k^2})$$

$$5^{x-k} = 5^{k^2+1} \checkmark$$

$$x-k = k^2+1 \checkmark$$

$$x = k^2+k+1 \checkmark$$

(4)

$$(c) \quad m(3)^3 + (3)^2 - 25(3) + 6m = 0 \checkmark$$

$$33m = 66 \checkmark$$

$$m = 2 \checkmark$$

$$(d) \quad \textcircled{1} \quad x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(2)(p)}}{2(2)} \checkmark \quad (3)$$

$$= \frac{3 \pm \sqrt{9-8p}}{4} \checkmark$$

(2)

$$\textcircled{2} \quad 9-8p = 0 \checkmark$$

$$p = \frac{9}{8} \checkmark$$

(2)

[22]

QUESTION 2

$$(a) \quad \textcircled{1} \quad x = -5 \checkmark \quad \text{and} \quad y = -7 \checkmark$$

(2)

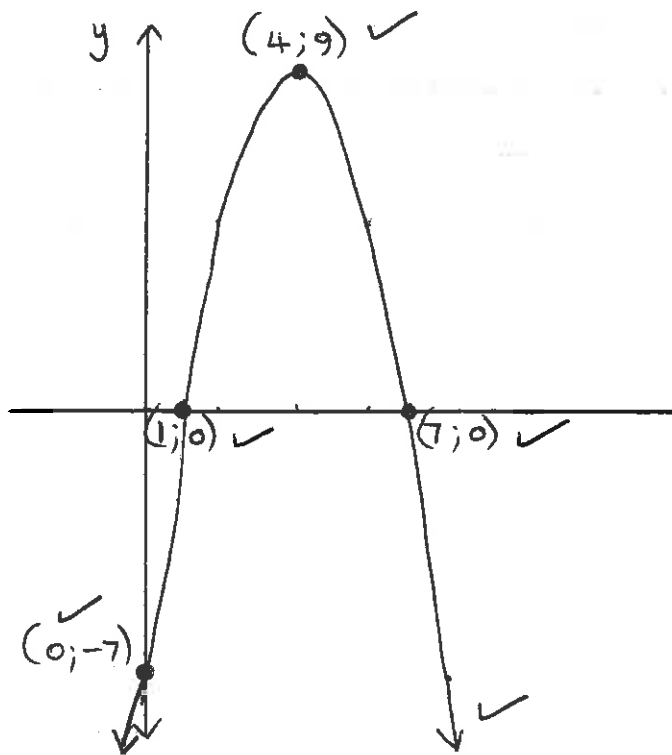
(2)

$$\begin{aligned} \textcircled{2} \quad f(-1) &= \frac{4}{-1+5} - 7 \\ &= -6 \end{aligned}$$

$$y + 6 = -\frac{1}{4}(x + 1)$$

$$y = -\frac{1}{4}x - \frac{25}{4}$$

(b)



(3)

(5)
[10]

QUESTION 3

$$\text{(a) } \textcircled{1} \quad OB = 17\,357 \left[\frac{1 - \left(1 + \frac{0,135}{12}\right)^{-36}}{\frac{0,135}{12}} \right] \checkmark \checkmark$$

$$= R\,511\,473,49 \checkmark$$

$$\underline{\text{OR}} \quad OB = 940\,000 \left(1 + \frac{0,135}{12}\right)^{48} - 17\,357 \left[\frac{\left(1 + \frac{0,135}{12}\right)^{48} - 1}{\frac{0,135}{12}} \right] \checkmark \checkmark$$

$$= R\,511\,473,42 \checkmark$$

(4)

③

$$\begin{aligned}
 \textcircled{2} \quad & (R17\,357 \times 48) - (R940\,000 - \overline{R511\,473,49}) \\
 & \text{OR: } R511\,473,42 \\
 & = R833\,136 - R428\,526,51 \\
 & \text{OR: } R428\,526,58 \\
 & = R404\,609,49 \quad \checkmark \\
 & \text{OR: } R404\,609,42
 \end{aligned}$$

(3)

$$\begin{aligned}
 \text{(b) } \textcircled{1} \quad & P = 785\,000 (1 - 0,18)^5 \\
 & = R291\,030,7769 \quad \checkmark
 \end{aligned}$$

$$\begin{aligned}
 & \text{M} \\
 P & = 785\,000 (1 + 0,06)^5 \\
 & = R1\,050\,507,078 \quad \checkmark
 \end{aligned}$$

$$\text{Value of Sinking Fund} = R759\,476,30 \quad \checkmark$$

$$\begin{aligned}
 \textcircled{2} \quad & 759\,476,30 = x \left[\frac{(1 + \frac{0,11}{4})^{20} - 1}{\frac{0,11}{4}} \right] \quad \checkmark \checkmark \\
 & x = R28\,990,52 \quad \checkmark
 \end{aligned}$$

(4)

(4)
[15]

QUESTION 4

$$\text{(a) } \textcircled{1} \quad \sum_{n=1}^{\infty} 27 \left(\frac{2}{3}\right)^{n-1} \quad \checkmark$$

$$\text{OR} \quad \sum_{n=1}^{\infty} 3^{4-n} \cdot 2^{n-1}$$

(3)

$$\textcircled{2} \quad -1 < r < 1 \quad \checkmark$$

$$\textcircled{3} \quad S_{\infty} = \frac{27}{1 - 2/3} \quad \checkmark$$

$$= 81 \quad \checkmark$$

(2)

(2)

(4)

$$\begin{aligned}
 (b) \quad T_4 &= 5 & T_{11} &= -37 \\
 a + 3d &= 5 \quad \checkmark & a + 10d &= -37 \quad \checkmark \\
 a &= 5 - 3d & 5 - 3d + 10d &= -37 \\
 a &= 5 - 3(-6) & 7d &= -42 \\
 &= 23 & d &= -6 \quad \checkmark \\
 & \therefore T_1 &= 23 \quad \checkmark
 \end{aligned}$$

OR:

$$\begin{aligned}
 7d &= -37 - 5 \\
 7d &= -42 \\
 d &= -6
 \end{aligned}$$

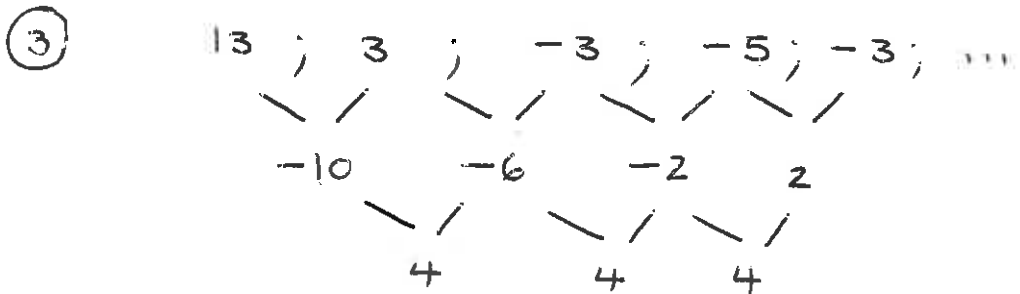
(5)

(c) ① Arithmetic sequence. It has a constant first difference. \checkmark

(2)

② Quadratic sequence. It has a constant second difference. \checkmark

(2)



$$\begin{aligned}
 2a &= 4 & 3a + b &= -10 \\
 a &= 2 \quad \checkmark & b &= -10 - 3(2) \\
 & & b &= -16 \quad \checkmark
 \end{aligned}$$

$$a + b + c = 13$$

$$2 - 16 + c = 13$$

$$c = 27 \quad \checkmark$$

$$T_n = 2n^2 - 16n + 27 \quad \checkmark$$

(4)
[19]

QUESTION 5

(a) $f(x) = 2x^2 - 5x$
 $f(x+h) = 2x^2 + 4xh + 2h^2 - 5x - 5h$ ✓
 $f'(x) = \lim_{h \rightarrow 0} \frac{2x^2 + 4xh + 2h^2 - 5x - 5h - (2x^2 - 5x)}{h}$ ✓
 $= \lim_{h \rightarrow 0} \frac{4xh + 2h^2 - 5h}{h}$ ✓
 $= \lim_{h \rightarrow 0} \frac{h(4x + 2h - 5)}{h}$ ✓
 $= 4x - 5$ ✓

(5)

(b) $y = 4x^3 - x^{-3/2}$ ✓
 $\frac{dy}{dx} = 12x^2 + \frac{3}{2}x^{-5/2}$ ✓
 $= 12x^2 + \frac{3}{2x^{5/2}}$ ✓

(4)

[9]

SECTION B

[75]

QUESTION 6

(a) ① $m = 0,32$ ✓

(1)

② No. ✓ $P(A \text{ and } B) \neq 0$ ✓
or $P(A) + P(B) \neq P(A \text{ or } B)$

(2)

③ Yes. ✓ $P(A) \times P(B) = 0,12$
and $P(A \text{ and } B) = 0,12$ ✓

(2)

⑥

$$(4) \quad P(A' \text{ or } B) = 0,92 \quad \checkmark$$

(1)

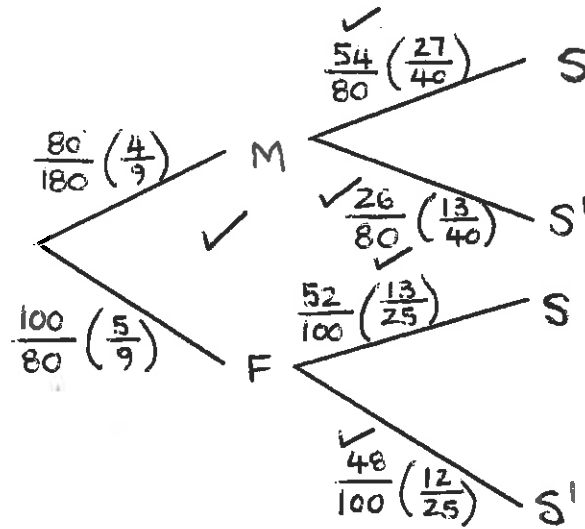
$$(b) \quad 1 ; 0,85 ; (0,85)^2 ; (0,85)^3 ; \dots \quad \checkmark$$

$$T_{24} = 1 (0,85)^{24-1} \quad \checkmark$$

$$= 0,024 \quad \checkmark$$

(3)

$$(c) \quad (1) \quad A = 52 \quad \checkmark \quad B = 74 \quad \checkmark$$



(2)

(5)

[16]

QUESTION 7

$$p ; pq ; pq^2 ; pq^3 ; \dots$$

$\swarrow \quad \swarrow \quad \swarrow$
 12 18 27

$$pq - p = 12 \quad \checkmark$$

$$pq^2 - pq = 18 \quad \checkmark$$

$$p \left(\frac{3}{2} \right) - p = 12 \quad \checkmark$$

$$q (pq - p) = 18$$

$$q (12) = 18$$

$$\frac{1}{2} p = 12$$

$$q = \frac{3}{2} \quad \checkmark$$

$$p = 24 \quad \checkmark$$

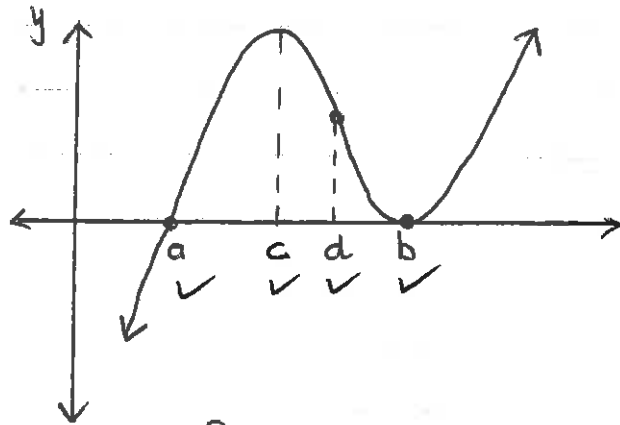
$$24 ; 36 ; 54 ; \dots \quad \checkmark$$

(7)

[7]

(7)

QUESTION 8



$$f'(x) \cdot f''(x) < 0$$

$$x < c \checkmark \text{ or } d \checkmark < x < b \checkmark$$

OR:

$$x \in (-\infty; c) \text{ or } (d; b)$$

(7)

[7]

QUESTION 9

$$(a) \quad \log_{\frac{1}{2}}(x-1) = 0 \checkmark \quad \underline{\text{OR}} \quad \log_{\frac{1}{2}}(p-1) = 0 \checkmark$$

$$x-1 = \left(\frac{1}{2}\right)^0 \checkmark$$

$$x = 2$$

$$\therefore p = 2 \checkmark$$

$$p-1 = \left(\frac{1}{2}\right)^0 \checkmark$$

$$p = 2 \checkmark$$

$$(b) \quad 1 \checkmark < x < 2 \checkmark \text{ or } x > 4 \checkmark \checkmark$$

(3)

$$\underline{\text{OR:}} \quad x \in (1; 2) \text{ or } (4; \infty)$$

(4)

$$(c) \quad x = \log_{\frac{1}{2}}(y-1) \checkmark$$

$$y-1 = \left(\frac{1}{2}\right)^x \checkmark$$

$$y = \left(\frac{1}{2}\right)^x + 1 \checkmark$$

(3)

(8)

(d) $y \in (1; \infty) \checkmark \checkmark$ OR $y > 1$

(2)

(e) $B(2; -12)$

$$f(x) = a(x-2)^2 - 12 \checkmark$$

$$0 = a(0-2)^2 - 12 \checkmark$$

$$12 = 4a$$

$$a = 3 \checkmark$$

$$f(x) = 3(x-2)^2 - 12$$

$$= 3x^2 - 12x \checkmark$$

$$a = 3, b = -12 \text{ and } c = 0$$

(4)

OR:

$$f(x) = ax(x-4) \checkmark$$

$$B(2; -12)$$

$$-12 = a(2)(2-4) \checkmark$$

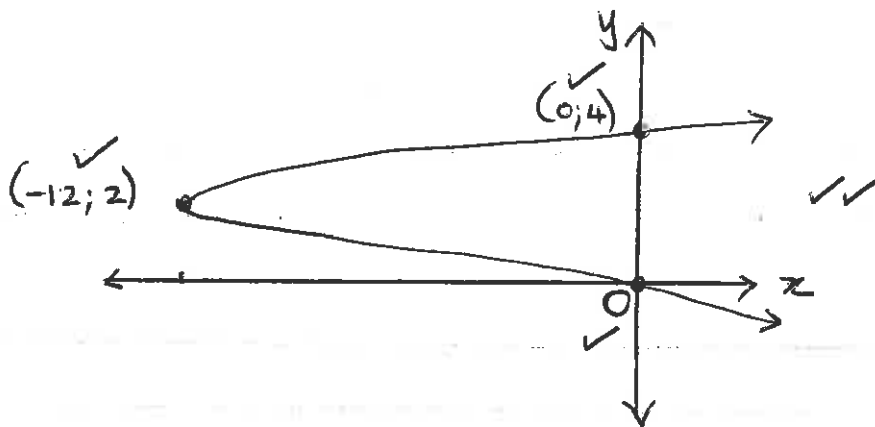
$$-12 = -4a$$

$$a = 3 \checkmark$$

$$f(x) = 3x(x-4)$$

$$= 3x^2 - 12x \checkmark$$

(f)



(5)

(g) $x \in [2; \infty) \checkmark$

OR $x \in (-\infty; 2]$

(i)

(9)

$$(h) \quad 5 \checkmark < k < 17 \checkmark$$

$$\text{OR} \quad k \in (5; 17)$$

(2)
[24]

QUESTION 10

$$(a) \quad V = 130,4 + \frac{4}{3} \pi (2,2)^3 \checkmark$$
$$= 175 \text{ cm}^3 \checkmark$$

(2)

$$(b) \quad A = 2x^2 + 4xh \checkmark$$

$$\text{but} \quad V = x^2h$$

$$x^2h = 175 \checkmark$$

$$h = \frac{175}{x^2} \checkmark$$

$$\therefore A = 2x^2 + 4x \left(\frac{175}{x^2} \right) \checkmark$$

$$= 2x^2 + \frac{700}{x}$$

(4)

$$(c) \quad A' = 4x - 700x^{-2} \checkmark$$

$$4x - \frac{700}{x^2} = 0 \checkmark$$

$$\times \underline{x^2} : \quad 4x^3 - 700 = 0$$

$$x^3 = 175$$

$$x = 5,6 \text{ cm} \checkmark$$

(3)

[9]

QUESTION 11

$$(a) \quad f'(x) = -6x^2 + 2ax + b \quad \checkmark$$

$$0 = -6(-4)^2 + 2a(-4) + b$$

$$b = 8a + 96 \quad \checkmark \quad \text{--- (1)}$$

$$0 = -6\left(\frac{2}{3}\right)^2 + 2a\left(\frac{2}{3}\right) + b$$

$$0 = -\frac{8}{3} + \frac{4}{3}a + b$$

$$\times 3: \quad 0 = -8 + 4a + 3b \quad \checkmark \quad \text{--- (2)}$$

Sub (1) into (2): $0 = -8 + 4a + 3(8a + 96) \quad \checkmark$

$$0 = -8 + 4a + 24a + 288$$

$$-280 = 28a$$

$$a = -10 \quad \checkmark$$

$$b = 8(-10) + 96$$

$$b = -16 \quad \checkmark$$

(6)

OR: $30 = -6(-1)^2 + 2a(-1) + b$

$$30 = -6 - 2a + b$$

$$b = 36 + 2a$$

$$\therefore 8a + 96 = 36 + 2a$$

$$a = -10$$

OR: $f'(x) = -6\left(x+4\right)\left(x-\frac{2}{3}\right) \quad \checkmark$

$$= -6x^2 - 20x + 16 \quad \checkmark$$

but $f'(x) = -6x^2 + 2ax + b \quad \checkmark$

$$\therefore 2a = -20 \quad \checkmark \quad \text{and} \quad b = 16 \quad \checkmark$$

$$a = -10 \quad \checkmark$$

(11)

$$(b) \quad p = -1 \checkmark \quad \text{from } C(-1; 30)$$

$\therefore (-1; 0)$ is a point on $f(x)$

$$f(x) = -2x^3 - 10x^2 + 16x + c$$

$$0 = -2(-1)^3 - 10(-1)^2 + 16(-1) + c \checkmark$$

$$c = 24 \checkmark$$

$$(c) \quad x = \frac{-4 + \frac{2}{3}}{2} \quad (3)$$

$$= -\frac{5}{3} \checkmark$$

$$x < -\frac{5}{3} \checkmark\checkmark \quad \text{OR} \quad x \in (-\infty; -\frac{5}{3}) \quad (3)$$

[12]

TOTAL: [150]