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GRADE 12

TRIALS 2023

TIME: 3 hours

PAPER 1 MEMO

MARKS: 150

QUESTION 1

1)a) $(x-1)(x+8) = 10$

$x^2 + 7x - 8 - 10 = 0 \checkmark^a$

$x^2 + 7x - 18 = 0$

$x = -9 \text{ or } x = 2 \checkmark^{ca}$

(3)

1a)2 $\sqrt{2-x} - x = 4$

$\sqrt{2-x} = x + 4$

$2-x = x^2 + 8x + 16 \checkmark^a$

$x^2 + 9x + 14 = 0 \checkmark^{ca}$

$x \neq -7 \text{ or } x = -2 \checkmark^{ca}$

(4)

1a)3) $3^{-x} \cdot 3^{x-2} = \frac{5^x}{3}$

$3^{-1} = 5^x \checkmark^a$

$x = \log_5 \frac{1}{3} \checkmark^{\text{using log correctly}}$

$x = -0,7 \checkmark^{ca}$

(3)

1a)4) $3x(2-x) \leq 0$

CV: $x = 0 \text{ or } x = 2 \checkmark^a$

$x \leq 0 \text{ or } 2 \leq x \checkmark^a$

(3)

b) $-15 \checkmark^a$

(1)

c) $(2x-3)(x+1) = 0$

$b = -1 ; c = -3$

(4)

d) $2^{y+2x} = 2^7 \checkmark^a$

$y = -2x + 7 \checkmark^a$

$\frac{-2x+7+5}{x-1} = \frac{1}{2} \checkmark^{ca}$

$\frac{-2x+12}{x-1} = \frac{1}{2}$

(5)

$-4x+24 = x-1$

$-5x = -25$

$x = 5 \checkmark^a$

$y = -3 \checkmark^a$

QUESTION 2

$$a) 100\,530 = 256\,000(1-i)^7 \quad \checkmark \text{ formula} \quad \checkmark \text{ a sub}$$

$$i = 1 - \sqrt[7]{\frac{100\,530}{256\,000}} \quad (3)$$

$$i = 0,125000\dots$$

$$x = 12,5\% \quad \checkmark \text{ ca}$$

$$b)1) i^{\text{eff}} = \left(1 + \frac{0,06}{12}\right)^{12} - 1 \quad \checkmark \text{ formula} \quad (2)$$

$$r = 6,2\% \quad \checkmark \text{ a}$$

$$b)2) F_v = \frac{2\,000 \left[\left(1 + \frac{0,06}{12}\right)^{61} - 1 \right]}{0,06} \quad \checkmark \text{ a formula} \quad \checkmark \text{ a}$$

$$= R142\,237,76 \quad \checkmark \text{ ca}$$

$$c) 2\,500\,000 = \frac{x \left[1 - \left(1 + \frac{0,132}{4}\right)^{-80} \right]}{0,132} \quad \checkmark \text{ a formula} \quad \checkmark \text{ a } 80 \& \div 4 \quad (3)$$

$$x = R89\,138$$

$$d)1) R2\,169 \times 60 - R100\,000 = R30\,140 \quad \checkmark \text{ ca} \quad (2)$$

$$d)2) \text{ Balance} = R100\,000 \left(1 + \frac{0,109}{12}\right)^{20} - \frac{1\,500 \left[\left(1 + \frac{0,109}{12}\right)^{20} - 1 \right]}{0,109} \quad \checkmark \text{ subtract} \quad \checkmark$$

$$= R87\,087,69 \quad (3)$$

QUESTION 3

$$a) a = 1 ; d = 3 \quad \checkmark \text{ a}$$

$$3\,725 = \frac{y}{2} [2(1) + (y-1)3] \quad \checkmark \text{ a sub in correct formula}$$

$$7\,450 = 3y^2 - y \quad (4)$$

$$3y^2 - y - 7\,450 = 0 \quad \checkmark \text{ ca}$$

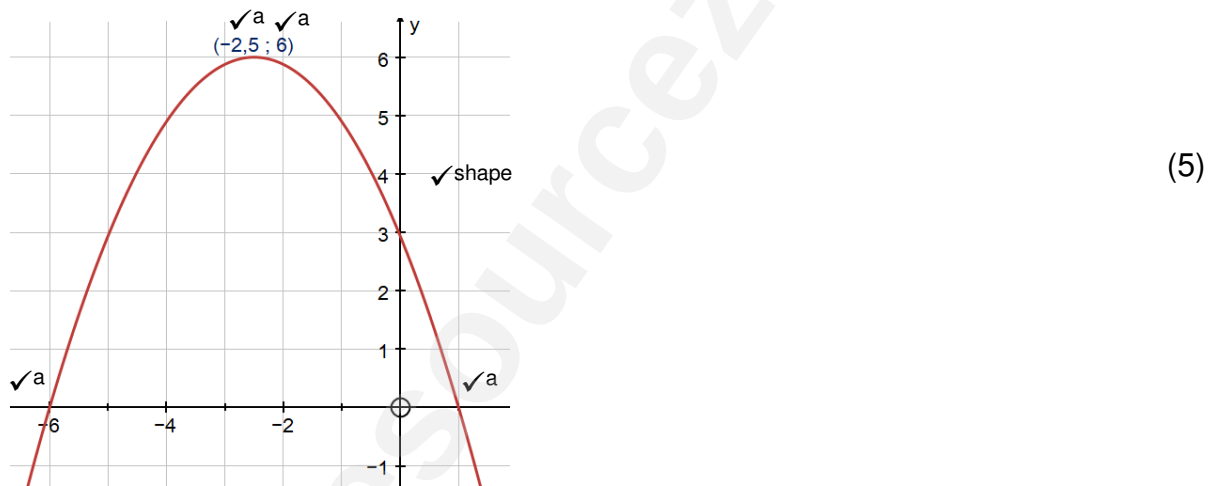
$$n = 50 \text{ or } n \neq -\frac{149}{3} \quad \checkmark \text{ ca}$$

$$b)1) T_n = -4n + 14 \quad \checkmark \text{ a } \checkmark \text{ a} \quad (2)$$

$$\begin{aligned}
 3b) 2a &= -4 & 3(-2) + b &= 10 \\
 a &= -2 \quad \checkmark^{ca} & b &= 16 \quad \checkmark^{ca} \\
 -54 &= -2(10)^2 + 16(10) + c \quad \checkmark^{\text{sub correctly}} \\
 c &= 14
 \end{aligned}
 \tag{3}$$

$$\begin{aligned}
 c) T_{12} &= 16 \left(\frac{1}{4} \right)^{11} \quad \checkmark^a \quad \checkmark^{\text{a formula}} \quad \checkmark^a \frac{1}{4} \\
 &= \frac{1}{262144}
 \end{aligned}
 \tag{3}$$

$$\begin{aligned}
 d) -1 < 5x + 1 < 1 & \quad \checkmark^a \text{ ratio } \checkmark^{-1 < r < 1} \\
 \frac{-2}{5} < x < 0 & \quad \checkmark^{ca} \quad x \neq \frac{-1}{5} \quad \checkmark^{ca}
 \end{aligned}
 \tag{4}$$

QUESTION 4**QUESTION 5**

$$\begin{aligned}
 a) -1 &= \log_a \frac{1}{2} \quad \checkmark \\
 a^{-1} &= \frac{1}{2} \quad \checkmark \\
 a &= 2
 \end{aligned}
 \tag{2}$$

$$\begin{aligned}
 b) x &= \log_2 y \\
 y &= 2^x \quad \checkmark
 \end{aligned}
 \tag{1}$$

$$c) x \leq 0 \quad \checkmark^a \tag{1}$$

$$d) \text{ reflected in the } y\text{-axis, translated 1 unit up} \quad \checkmark^a \tag{2}$$

$$e) y = x \quad \checkmark^a \tag{1}$$

QUESTION 6

$$\begin{aligned}
 \text{a) } f'(x) &= \lim_{h \rightarrow 0} \frac{3(x+h)^2 + 2(x+h) - (3x^2 + 2x)}{h} \quad \checkmark \text{ formula} \\
 &= \lim_{h \rightarrow 0} \frac{3x^2 + 6xh + 3h^2 + 2x + 2h - 3x^2 - 2x}{h} \quad \checkmark \text{ a sub} \\
 &= \lim_{h \rightarrow 0} \frac{6xh + 3h^2 + 2h}{h} \quad \checkmark \text{ ca} \\
 &= \lim_{h \rightarrow 0} \frac{h(6x + 3h + 2)}{h} \quad \checkmark \text{ factorise} \\
 &= \lim_{h \rightarrow 0} (6x + 3h + 2) \\
 &= 6x + 2 \quad \checkmark \text{ ca}
 \end{aligned} \tag{5}$$

$$\begin{aligned}
 \text{b) } y &= \frac{-2}{x} + 3\sqrt[3]{x} \\
 &= -2x^{-1} + 3x^{\frac{1}{3}} \quad \checkmark \text{ a} \\
 \frac{dy}{dx} &= 2x^{-2} + x^{-\frac{2}{3}} \quad \checkmark \text{ ca}
 \end{aligned} \tag{4}$$

$$\begin{aligned}
 \text{c) } \lim_{x \rightarrow 3} \frac{x-3}{(x-3)(x+3)} &\quad \checkmark \text{ factorising} \\
 \lim_{x \rightarrow 3} \frac{1}{x+3} &= \frac{1}{6} \quad \checkmark \text{ ca}
 \end{aligned} \tag{3}$$

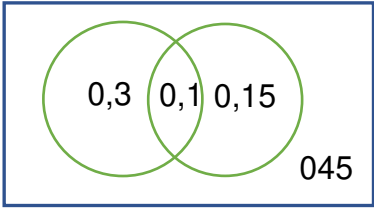
QUESTION 7

$$\begin{aligned}
 \text{a) } V_{\text{cone 1}} &= \frac{1}{3} \pi (9)^2 \times 24 \quad \checkmark \text{ a 9} \quad V_{\text{cone 2}} = \frac{1}{3} \pi (3)^2 \times 8 \quad \checkmark \text{ a 3 and 8} \\
 &= 648\pi \quad = 24\pi \\
 r &= \frac{24\pi}{648\pi} = \frac{1}{27} \quad \checkmark \text{ ca} \\
 S_{\infty} &= \frac{648\pi}{1 - \frac{1}{27}} \quad \checkmark \text{ sub into correct formula} \quad \text{if just } r = \left(\frac{1}{3}\right)^3 = \frac{1}{27} \quad \checkmark \checkmark \\
 &= 2\,114,1 \text{ cm}^3 \quad \checkmark \text{ ca} \quad V_{\text{cone 1}} \quad \checkmark
 \end{aligned} \tag{5}$$

$$\begin{aligned}
 \text{b) } \left(1 + \frac{1}{2}\right) \left(1 + \frac{1}{3}\right) \left(1 + \frac{1}{4}\right) \left(1 + \frac{1}{5}\right) \dots \left(1 + \frac{1}{99}\right) &\quad \checkmark \text{ a} \\
 &= \left(\frac{3}{2}\right) \left(\frac{4}{3}\right) \left(\frac{5}{4}\right) \left(\frac{6}{5}\right) \times \dots \times \left(\frac{99}{98}\right) \left(\frac{100}{99}\right) \quad \checkmark \text{ making fractions improper} \\
 &= \frac{100}{2} \\
 &= 50 \quad \checkmark \text{ a}
 \end{aligned} \tag{3}$$

QUESTION 8

a) $\frac{46}{80} \times \frac{45}{79} = 0,3275... \approx 0,33$ (4)

b)  (4)

c)1) $7^4 = 2\ 401$ ✓ (1)

c)2) $(1 \times 5 \times 4 \times 3) + (1 \times 5 \times 4 \times 2) + (1 \times 5 \times 4 \times 3) = 160$ (3)

OR $3 \times 5 \times 4 \times 2 = 160$

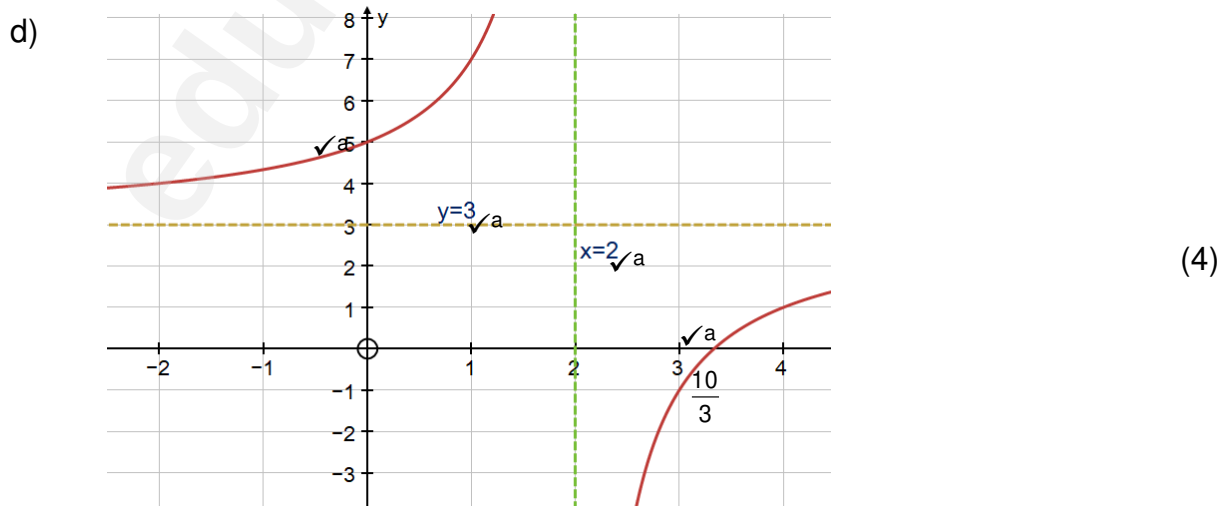
d) $P(\text{not together}) = 1 - \frac{2!4!}{5!} = 0,6$ (4)

QUESTION 9

a) $x \in R, x \neq 3$ ✓^a (1)

b) $x = 3$ ✓^a
 $y = 2$ ✓^a (2)

c) $y = \frac{-4}{-3} + 2$ ✓^a $x=0$
 $y = \frac{10}{3}$ ✓^{ca} (2)



QUESTION 10

a) $x = \frac{-(-6)}{2(-1)}$ ✓method for calculating axis of symmetry

$$= -3 \checkmark^a$$

$$y = -(-3)^2 - 6(-3) - 5 \quad (4)$$

$$= 4 \checkmark^{ca}$$

$$y \leq 4 \checkmark^{ca}$$

b) $x + 5 = -x^2 - 6x - 5 \checkmark^a$

$$x^2 + 7x + 10 = 0 \checkmark^a$$

$$x = \frac{-5}{\checkmark^{ca}} \text{ or } x = -2 \checkmark^{ca} \quad (4)$$

c) $\frac{9}{4} = -x^2 - 6x - 5 - (x + 5) \checkmark^a \text{ for equation}$

$$\frac{9}{4} = -x^2 - 7x - 10$$

$$0 = x^2 + 7x + \frac{49}{4} \checkmark^{ca} \quad (3)$$

$$x = \frac{-7}{2} \checkmark^{ca}$$

d) $-5 < x < -2 \checkmark^{ca} \quad (2)$

e) $-2x - 6 = -1 \checkmark^a$

$$x = \frac{-5}{2} \checkmark^a \quad (3)$$

QUESTION 11

a)1) $f'(x) = 3x^2 + 2bx \checkmark^a$

$$6(-2)^2 + 2b(-2) = 0 \checkmark^a \quad (3)$$

$$12 - 4b = 0$$

$$b = 3$$

a)2) $6x + 6 = 3 \checkmark^a$

$$x = \frac{-1}{2} \checkmark^a \quad (3)$$

a)3) $C(-2; -3)$ ✓^a
 $D(-1; -3)$ ✓^a ✓^{ca}

$$\text{Area} = \frac{1}{2}(1)(4) \checkmark^{\text{ca}}$$

$$= 2 \text{ unit}^2$$
 (4)

b) $y = a(x+3)(x+3)(2x-1)$ ✓^a method ✓^a sub
 $18 = a(-4+3)(-4+3)(2(-4)-1)$ ✓^{sub} (-4;18)
 $18 = -9a$
 $a = -2$ ✓^{ca} (5)
 $y = -2(x^2 + 6x + 9)(2x - 1)$
 $y = -2(2x^3 + 11x^2 + 12x - 9)$
 $y = -4x^3 - 22x^2 - 24x + 18$ ✓^{ca}

QUESTION 12

$C(x; -x^2 - 4)$ ✓^a
 $MC = \sqrt{(0-x)^2 + (-6+x^2+4)}$ ✓^{sub} into distance formula

$$= \sqrt{x^2 + (-2+x^2)^2}$$

$$= \sqrt{x^2 + 4 - 4x^2 + x^4}$$

$$= \sqrt{x^4 - 3x^2 + 4}$$
 ✓^{ca}

$$\frac{dMC}{dx} = 4x^3 - 6x = 0$$
 ✓^{ca}

$$x = \sqrt{\frac{3}{2}}$$
 ✓^a

$$MC = \sqrt{\left(\sqrt{\frac{3}{2}}\right)^4 - 3\left(\sqrt{\frac{3}{2}}\right)^2 + 4}$$
 ✓^{sub}

$$= 1,6 \text{ units}$$
 ✓^{ca} (7)