

GRADE 12 PAPER 1 MEMO

Question 1:

(a)

(1) $x=3$ ✓

$x=0$ ✓

(2)

(2) $7 - (x^2 + 5x + 6) = 0$

$7 - x^2 - 5x - 6 = 0$

$0 = x^2 + 5x - 1$ ✓^m

$x = \frac{-5 \pm \sqrt{25 - 4(1)(-1)}}{2}$ ✓^m

$x = 0,2$ ✓^a $x = -5,2$ ✓^a (4)

(3) $\log_3(2x-1) = 3$ ✓^a

$3^3 = 2x-1$ ✓^m

$27 = 2x-1$ ✓^{ca}

$28 = 2x$

$x = 14$ ✓^a

(4)

(b) $3x^2 - 6x + 5 \leq 0$ ✓^m

$(3x-1)(x-5) \leq 0$



$\frac{1}{3} \leq x \leq 5$

or $x \in \left[\frac{1}{3}; 5 \right]$ (4)

(c)

(1) $n = -3$ ✓

(1)

(2) $m = 5/3$ ✓

(1)

(3) $m \in \mathbb{R}$ ✓✓

(2)

(d) $3(x^2-1)^2 - 5 = 3+k$

$3x^2 - 6x + 3 - 5 - 3 - k = 0$

$3x^2 - 6x - 5 - k = 0$ ✓

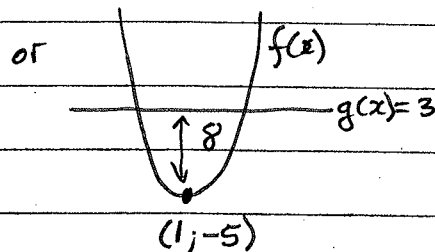
$b^2 - 4ac > 0$ ✓^m

$(-6)^2 - 4(3)(-5-k) > 0$

$36 + 60 + 12k > 0$

$12k > -96$

$k > -8$ ✓^a (3)



$\therefore k > -8$

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Question 2:

$$(a) T_n = \frac{n}{(n+1)^2} \sqrt{a} \quad (2)$$

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

$$T_{100} = 20 + (100-1)(-2)$$

$$T_{100} = -178 \quad \checkmark \quad (2)$$

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

$$80 = \frac{n}{2}(40 + (n-1)(-2))$$

$$160 = n(42 - 2n)$$

$$2n^2 - 42n + 160 = 0$$

$$n^2 - 21n + 80 = 0$$

$$(n-16)(n-5) = 0$$

$$n = 16 \quad n = 5 \quad (5)$$

$$(c) (1) S_6 = 3^{6+1} - 3$$

$$S_6 = 2184 \quad \checkmark \quad (1)$$

$$(2) S_1 = 6$$

$$S_2 = 24 \quad \checkmark \quad m$$

$$S_3 = 78$$

$$T_1 = 6 \quad \checkmark \quad a$$

$$T_2 = 18 \quad \checkmark \quad a$$

$$T_3 = 54 \quad \checkmark \quad a \quad (4)$$

$$(d) \sum_{n=3}^6 5 \cdot 2^{-n}$$

$$= \frac{5}{8} + \frac{5}{16} + \frac{5}{32} + \frac{5}{64}$$

$$= \frac{75}{64} \quad \checkmark$$

(4)

[18]

Question 3^o

$$\begin{aligned}
 \text{(a) } f'(x) &= \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} \quad \text{notation} \\
 &= \lim_{h \rightarrow 0} \frac{4x^2 + 8xh + 4h^2 - 2 - 4x^2 + 2}{h} \\
 &= \lim_{h \rightarrow 0} \frac{8xh + 4h^2}{h} \\
 &= \lim_{h \rightarrow 0} \frac{h(8x + 4h)}{h} \\
 &= \lim_{h \rightarrow 0} 8x + 4h \\
 \underline{f'(x)} &= \underline{8x} \quad \checkmark \quad (5)
 \end{aligned}$$

$$\begin{aligned}
 \text{(b)(1) } y &= 3x^5 - 14x^{\frac{1}{2}} + 3x^{-1} \\
 \frac{dy}{dx} &= 15x^4 - 7x^{-\frac{1}{2}} - 3x^{-2} \\
 &= 15x^4 - \frac{7}{x^{\frac{1}{2}}} - \frac{3}{x^2} \quad \checkmark \text{ pos} \quad (4)
 \end{aligned}$$

$$\begin{aligned}
 \text{(2) } y &= \frac{5x}{10x^2} - \frac{2}{10x^2} \\
 y &= \frac{1}{2}x^{-1} - \frac{1}{5}x^{-2} \quad \checkmark \text{ m} \\
 \frac{dy}{dx} &= -\frac{1}{2}x^{-2} + \frac{2}{5}x^{-3} \quad \checkmark \text{ ca} \\
 &= -\frac{1}{2x^2} + \frac{2}{5x^3} \quad \checkmark \text{ pos} \quad (5)
 \end{aligned}$$

$$\begin{aligned}
 \text{(c) } f(x) &= x^{\frac{1}{2}}(x+2) \\
 &= x^{\frac{3}{2}} + 2x^{\frac{1}{2}} \quad \checkmark \text{ m} \\
 f'(x) &= \frac{3}{2}x^{\frac{1}{2}} + x^{-\frac{1}{2}} \quad \checkmark \text{ ca} \\
 f'\left(\frac{1}{4}\right) &= \frac{3}{2}\left(\frac{1}{4}\right)^{\frac{1}{2}} + \left(\frac{1}{4}\right)^{-\frac{1}{2}} \\
 &= \frac{11}{4} \quad \checkmark \text{ sub} \quad (5)
 \end{aligned}$$

Question 4:

(a) (1) $x \in \mathbb{R}, x \neq -2$ (2)

(2) $x = -2$ ✓
 $y = -2$ ✓ (2)

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

(4) $y = \frac{-3}{x} - 2$ (2)

(b) (1) $q = 5$ ✓
 $a = -2$ ✓ (2)

(2) $x > 0$ ✓
sign (2)

(3) $x \in (0; 1] \cup [5/2; \infty)$ (3)

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Question 5:

$$(a) 14 + 30 + 41 + x = 156 \quad \checkmark^m$$

$$x = 71 \quad \checkmark^a$$

$$12 + 14 + 30 + 4 + 41 + 71 + y + 6 = 200$$

$$y = 22 \quad \checkmark^a$$

(3)

$$(b) \frac{12 + 41 + 22}{200} = \frac{75}{200} \quad \checkmark^m$$
$$= \frac{3}{8} \quad \checkmark^a$$

(2)

[5]

Question 6^a

$$(a)(1)(i) = \frac{30}{400} \checkmark_a \\ = \underline{\underline{3/40}} \quad (1)$$

$$(ii) \frac{240}{400} \checkmark_a \\ = \underline{\underline{3/5}} \quad (1)$$

$$(iii) \frac{130}{160} \checkmark_{num} \\ = \underline{\underline{13/16}} \checkmark_{den} \quad (2)$$

$$(2) P(A) \times P(B) = P(A \cap B) \checkmark_m \\ \frac{160}{400} \times \frac{170}{400} = \frac{30}{400} \checkmark_a \\ \frac{17}{100} \neq \frac{3}{40} \checkmark_a$$

∴ being employed is not independent of gender. (3)

$$(b)(1) 7! = \underline{\underline{5040}} \checkmark \quad (1)$$

$$(2) 4 \times 3 \times 5! \checkmark \\ = \underline{\underline{1440}} \checkmark \quad (3)$$

(3) B = Boys sitting together

$$B = 5! \cdot 3! = 720 \checkmark \checkmark \quad (\text{or } 5 \times 3! \times 4! = 720)$$

$$\therefore 7! - 720 = 4320 \checkmark$$

(3)

[14]

Question 7:

$$(a) f'(x) = 3x^2 + 2bx + c \quad \checkmark^m$$

$$f'(-1) = 3 + 2b + c = 5 \quad \checkmark^{sub}$$

$$c = 2 + 2b$$

$$f''(x) = 6x + 2b \quad \checkmark^{ca}$$

$$f''(-1) = -6 + 2b = -16 \quad \checkmark^{sub}$$

$$2b = -10$$

$$b = -5 \quad \checkmark^a$$

$$\therefore c = 2 + 2(-5) \quad \checkmark^{ca}$$

$$c = -8 \quad \checkmark^a$$

(7)

$$(b) f(x) = 3x^2 - 10x - 8 \quad \checkmark^{ca}$$

$$f''(x) = 6x - 10 = 0 \quad \checkmark^{ca}$$

$$6x = 10$$

$$x = \frac{5}{3} \quad \checkmark^{ca}$$

$$\therefore x \in \left(\frac{5}{3}; \infty\right) \quad \checkmark^{ca}$$

(3)

$$(c) f'(x) = -11 \quad \checkmark^m$$

$$\therefore 3x^2 - 10x - 8 = -11 \quad \checkmark^m$$

$$3x^2 - 10x + 3 = 0$$

$$(3x - 1)(x - 3) = 0 \quad \checkmark$$

$$x = \frac{1}{3} \quad \checkmark \quad x = 3$$

$$\therefore k = 3 \quad \checkmark$$

$$t = -11(3) + 3 \quad \checkmark$$

$$t = -33 + 3$$

$$t = -30 \quad \checkmark$$

(6)

[16]

Question 8:

$$(a) 14 = a + 4d \quad \checkmark^m$$

$$a = 14 - 4d \quad \dots (1)$$

$$160 = \frac{10}{2}(2a + 9d) \quad \checkmark^m$$

$$160 = 5(2a + 9d) \quad \checkmark^m$$

$$32 = 2a + 9d \quad \dots (2)$$

$$(1) \text{ into } (2) \quad 32 = 2(14 - 4d) + 9d \quad \checkmark^{ca}$$

$$32 = 28 - 8d + 9d$$

$$4 = d \quad \checkmark^a$$

$$a = -2 \quad \checkmark^a$$

(5)

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

$$= \frac{100(1-0.7^n)}{0.3} \quad \checkmark$$

$$S(n) = \frac{1000}{3}(1-0.7^n) \quad \checkmark$$

(4)

$$(2) S_{\infty} = \frac{a}{1-r} \quad \checkmark$$

$$= \frac{100}{0.3} \quad \checkmark$$

$$= \frac{1000}{3} \quad \checkmark$$

(2)

$$(c) \sum_{t=1}^{12} (24 - 3t) = 21 + 18 + \dots + (-12) \quad \checkmark^m$$

$$= \frac{12(21 - 12)}{2} \quad \checkmark^{ca}$$

$$= 54 \quad \checkmark^a$$

$$\sum_{k=1}^{\infty} 27p^k = 27p + 27p^2 + 27p^3 + \dots = 54 \quad \checkmark^m$$

$$\sum_{k=1}^{\infty} \frac{27p}{1-p} = 54 \quad \checkmark^{ca}$$

$$27p = 54 - 54p$$

$$81p = 54$$

$$p = \frac{2}{3} \quad \checkmark^a$$

(6)

[17]

Question 9:

(a) (1) $y=1$ ✓ (1)

(2) $\frac{dy}{dx} = -\frac{1}{2}x + p = -\frac{1}{2}$ ✓_m ✓_{ca}

sub in $x=4$: $-\frac{1}{2}(4) + p = -\frac{1}{2}$ ✓_{sub}

$p = \frac{3}{2}$ ✓_a (4)

(3) $-3x^2 + 24x - 45 = 0$ ✓_m

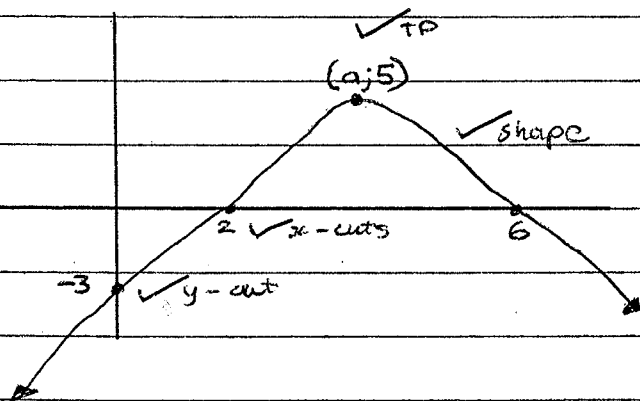
$x^2 - 8x + 15 = 0$

$(x-3)(x-5) = 0$ ✓_{ca}

$x=3$ $x=5$

∴ $x=3$ ✓_a (3)

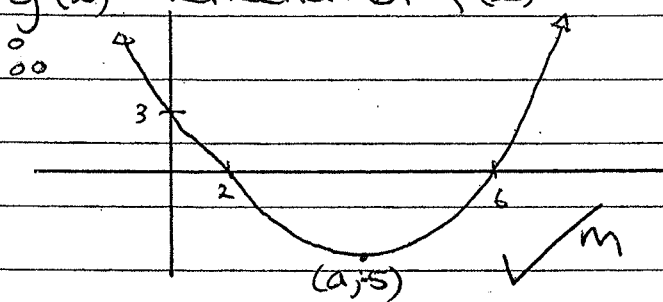
(b) (1)



y-int = -3
x-int = 2 / 6
TP = a, 5.

(4)

(2) $g'(x) =$ reflection of $f'(x)$



$g'(x)$ must be positive

∴ $x < 2$ or $x > 6$ ✓_a

$x \in (-\infty; 2) \cup (6; \infty)$

(2)

[14]

Question 10:

$$(a) \quad BP = 60 - 2x \quad \checkmark^m \\ CQ = 40 - x$$

$$\text{Area } ABCD = 60 \times 40 = 2400 \text{ cm}^2 \quad \checkmark^a$$

$$\text{Area } \triangle PCQ = \frac{1}{2}(2x)(40 - x) \\ = 40x - x^2 \quad \checkmark^{ca}$$

$$\text{Area } \triangle QD = \frac{1}{2}(x)(60) \\ = 30x \quad \checkmark^{ca}$$

$$\text{Area } \triangle ABP = \frac{1}{2}(40)(60 - 2x) \\ = 1200 - 40x \quad \checkmark^{ca}$$

$$\text{Playground} = 2400 - (40x - x^2 + 30x + 1200 - 40x) \\ = 2400 - (-x^2 + 30x + 1200)$$

$$\underline{A = x^2 - 30x + 1200} \quad \checkmark^a \quad (7)$$

$$(b) \quad \frac{dA}{dx} = 0$$

$$2x - 30 = 0 \quad \checkmark^a$$

$$x = 15 \quad \checkmark^a$$

$$\therefore \text{Min Area} = (15)^2 - 30(15) + 1200 \\ = \underline{975 \text{ m}^2} \quad \checkmark^{ca} \quad (4)$$

[11]