

Form A Paper 1 Nov.

Memo.

Section A.

Question 1.

(a)

RP (i) $(2x-1)(x+3) = 9.$

$$2x^2 + 5x - 12 = 0.$$

$$(2x-3)(x+4) = 0$$

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

must show these 2 steps to get =

(3)

RP (ii)

$$\frac{15}{x-1} - \frac{x+3}{x(x+1)} = \frac{12}{x}$$

LCD $x(x+1)(x-1)$

$$\Rightarrow 15x(x+1) - (x+3)(x-1) = 12(x^2-1)$$

$$15x^2 + 15x - x^2 - 2x + 3 = 12x^2 - 12$$

$$2x^2 + 13x + 15 = 0.$$

$$(2x+3)(x+5)$$

$$x = -\frac{3}{2} \text{ or } -5$$

following correct algebra.
max 3/5 if incorrect answer

(5)

RP (iii)

$$2x+1 \sqrt{x+1} = 1$$

$$(\sqrt{x+1})^2 = (1-2x)^2$$

$$x+1 = 1 - 4x + 4x^2$$

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

$$x(4x-5) = 0.$$

$$x = 0 \text{ or } x = \frac{5}{4}$$

check

$$x = 0. \checkmark$$

Subst

$$x = \frac{5}{4}$$

$$\frac{5}{2} + \sqrt{\frac{9}{4}} = \frac{5}{2} + \frac{3}{2}$$

$$= 4$$

(14) RP. $-3 \begin{cases} (3x+1)(x-4) < 0 \\ (3x+1)(x-4) > 0 \end{cases}$ and (> 0)

CP (v)

$$4x^2 + 8x - 12 = 0 \quad \div 4$$

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

$$x^2 + 2x = 3$$

$$(x+1)^2 = 4$$

$$x+1 = \pm 2$$

$$x = 1 \text{ or } -3$$

✓ Sq. root both sides

(3)

(4)

(15) RP

$$2x - y = 8 \quad (1) \quad x^2 - 2xy + y^2 = 19 \quad (2)$$

$$y = 2x - 8 \quad (3) \text{ Sub (3) into (2)}$$

$$x^2 - 2x(2x-8) + (2x-8)^2 = 19$$

$$x^2 - 4x^2 + 16x + 4x^2 - 32x + 64 - 19 = 0$$

$$3x^2 - 24x + 45 = 0$$

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

$$(x-5)(x-3) = 0$$

$$x = 5 \text{ or } 3$$

$$y = 2 \text{ or } -2$$

✓ ca.

(6)

[26]

Question 2.

$$\begin{aligned}
 \text{(i) RP. (1)} \quad & 4x^{\frac{1}{2}} \cdot (8x^3)^{-\frac{1}{3}} \\
 & = 2^2 x^{\frac{1}{2}} \cdot 2^{-1} x^{-1} \quad \text{a.} \\
 & = 2 \cdot x^{-\frac{1}{2}} = \frac{2}{x^{\frac{1}{2}}} \quad \text{(3)}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii) RP.} \quad & \frac{6^{n+2} \cdot 2^{n-1}}{12^{n+2}} = \frac{2^{n+2} \cdot 3^{n+2} \cdot 2^{n-1}}{3^{n+2} \cdot 2^{2n+4}} \\
 & = 2^{n+2+n-1-2n-4} \cdot 3^{n+2-n-2} \\
 & = 2^{-3} = \frac{1}{8} \quad \text{(3.)}
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii) RP} \quad & \frac{3^x(3+1)}{3^x(2+8)} = \frac{4}{2+8} \cdot \frac{4}{10} \quad \text{(3)} \\
 & = \frac{2}{5}
 \end{aligned}$$

b) RP.

$$2^{x+2} + 2^x = 20$$

$$2^x(4+1) = 20$$

$$2^x \cdot 5 = 20$$

$$2^x = 2^2 \cdot 2$$

$$\underline{x = 2}$$

[13] (4)

Question 3.

RP (a) $P(FA) = \frac{6101}{10730} = 0,57$

RP (b) $P(u FA) = \frac{4222}{8120}$

CP (c) $P(B \text{ undergrad}) \times P(FA')$
 $= \frac{8120}{10730} \times \frac{4629}{10730}$

$= 0,33$

$P(\text{undergrad} \cap FA')$

$= \frac{3898}{10730} = 0,37$

not independent

(5)
[9]

Question 4

(a) RP $-1; -7; -11; p$
 $-6 \quad -4 \quad p+11$

$\checkmark 2 = p+11+4$
 $-13 = p$

$\underline{p = -13} \checkmark$ (1)
ans. only

(b) RP

$2 = 2a$
 $a = 1$
 $3 + b = -6$
 $\checkmark a \quad b = -9 \checkmark ca$

$1 - 9 + c = -1$
 $c = 7 \checkmark ca$

$T_n = n^2 - 9n + 7$

[A] (3)

$a = -1$

$-3 + b = -6$
 $b = -3$

$-1 - 3 + c = -1$
 $c = 3$

Question 5

(a) RP

$9304,60 = 7000 \left(1 + \frac{i}{4}\right)^{12}$
 $\sqrt[12]{\frac{9304,6}{7000}} - 1 = \frac{i}{4} \checkmark ca$

$0,024 = \frac{i}{4}$

nominal $i = \underline{9,6\% \text{ p.a.}}$ compounded quarterly

(b) RP

$i_{\text{eff}} = \left(1 + \frac{9,6\%}{4}\right)^4 - 1 \checkmark ca$

$i_{\text{eff}} = 9,95\% \text{ p.a.}$

[7] (3)

Question 6

RP(a) $x = -1$ ✓ $y = 1$ ✓ k (2)

RP(b) $y = \frac{a}{x+1} + 1$ ✓ CP/ RP
Sub $(3; \frac{3}{2})$ ✓ $\frac{3}{2} = \frac{a}{4} + 1$

$\frac{1}{2} = \frac{a}{4}$

$f(x) = y = \frac{2}{x+1} + 1$ $2 = a$ ✓

RP(c) $y = x+1 + 1 \Rightarrow \underline{y = x+2}$ (3) (2)

RP(d) Y-intercept $x=0$ $y = 2 + 1 = 3$
X-int $y=0$ $0 = \frac{2}{x+1} + 1$ $-x-1 = 2$ $-x = 3$ $x = -3$ $A(-3; 0)$ (3)
 $C(0; 3)$ *Must be coordinates*
if nothing else correct; give 1 mark for these statements

RP(e) pt $(-1; 1)$
 $C(0; 3)$ $y - 1 = m(x + 1)$ (2)
 $m = \frac{2}{1} = 2$ ✓ $y - 1 = 2(x + 1)$
 $y = 2x + 3$ *Must show a method*
OR $y = mx + c$ ✓ $c = 3$
Sub $(-1; 1)$ ✓ $1 = -m + 3$
 $-2 = -m$
 $m = 2$ (2)

(i) solve $y = 2x + 3$

CP. and $y = \frac{2}{x+1} + 1$ simultaneously

$$2x + 3 = \frac{2}{x+1} + 1 \quad \checkmark m$$

$$2x + 2 = \frac{2}{x+1} \quad x + 1 = \frac{1}{x+1}$$

$$x^2 + 2x + 1 = 1 \quad \checkmark a.$$

$$x(x+2) = 0 \quad \checkmark ca. \quad x = 0 \quad \text{or} \quad x = -2.$$

Sub $x = -2$ into $y = 2x + 3.$

$$D(-2; -1) \quad \checkmark \quad \text{(no need for rounds here.)}$$

(5)

SECTION B

Question 7.

$$f(x) = 4 \cdot 2^{x-1} + 1$$

$$= 2^2 \cdot 2^{x-1} + 1$$

$$= 2^{x+1} + 1$$

RP (a)

$y = 1$ ✓ (1) K.

CP (b)

Range $y \in (1; \infty)$ ✓ or $y > 1$ K
 Domain $x \in \mathbb{R}$ ✓ or $-\infty < x < \infty$ (2)

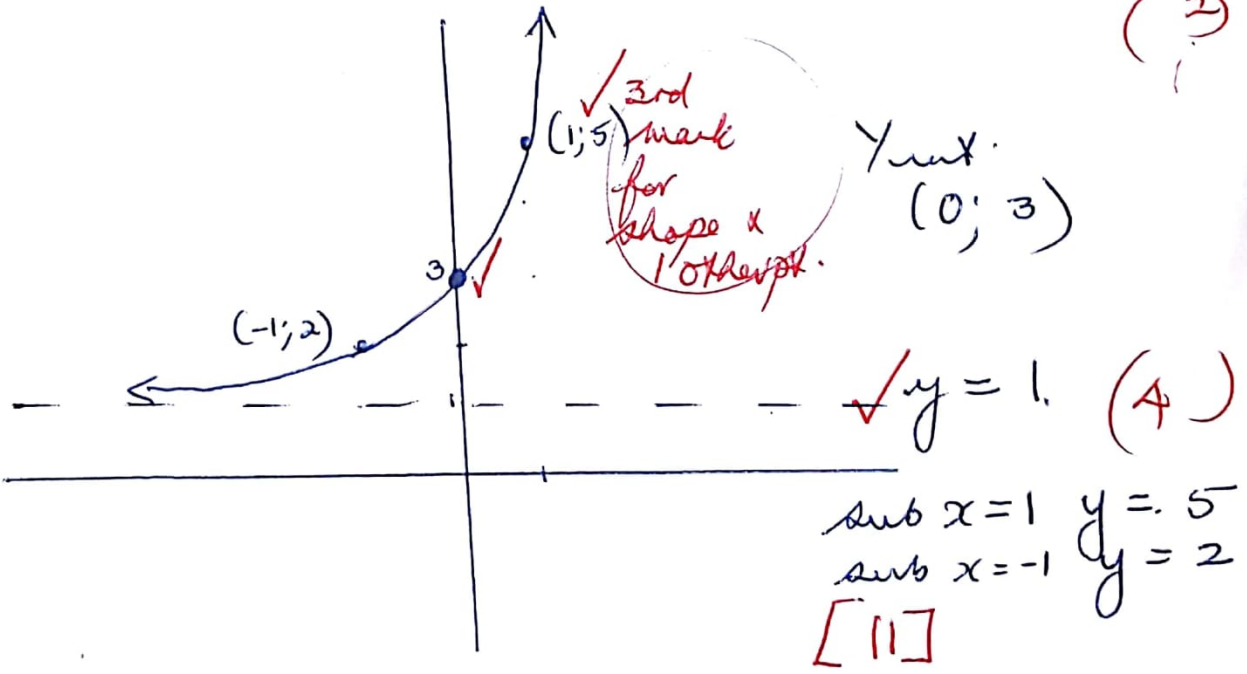
CP (c)

$g(x) = \frac{-4 \cdot 2^{x-1} - 1}{2^{x+1} - 1}$ ✓ CP (2) K.

CP (d)

$h(x) = \frac{2^{x+1-2} - 3 + 1}{2^{x+1} - 2}$ OR $h(x) = \frac{4 \cdot 2^{x-3} - 2}{2^{x+1} - 2}$ ✓ (2)

RP (e)



Section B

Question 8

CP (a) $ax+c=px-d$ $x(a-p) = -c-d$
 $ax - px = -c-d$ $x = \frac{-c-d}{a-p}$ (2)

CP (b) $(mx+1)(xc-m) = 0$
 $xc = -\frac{1}{m}$ or $x = m$. (2)

CP (c) $-2x < 4 - 10m$
 $xc > -\frac{1}{2} + 5m$. (2)

Question 9

CP $T_2 = T_4 = 0$.

$x ; 0 ; y ; 0$

$-x$ y $-y$ \sqrt{m}

$y + xc = -2y$
 $x = -\frac{2y}{a}$
 $T_1 = x = 18$ ✓

$-2y = 12$
 $y = -6$

$T_3 = y = -6$

(6)

$d_2 = 12$ $2a = 12$
 $a = 6$ ✓

$T_n = 6n^2 + bn + C$

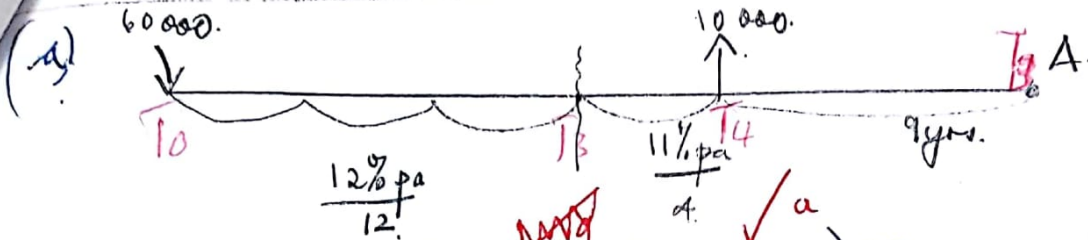
$a+b+C = T_1$
 $6 + -36 + C = T_1$
 $6 - 36 + 48 = T_1 = 18$ ✓

$T_2 = 0 \Rightarrow 24 + 2b + C = 0$
 $T_4 = 0 \Rightarrow 96 + 4b + C = 0$
 $72 + 2b = 0$
 $b = -36$ ✓

$T_n = 6n^2 - 36n + C$
 $T_2 = 24 - 72 + C = 0$
 $C = 48$

$\frac{T_n}{T_3} = \frac{6n^2 - 36n + 48}{54 - 108 + 48}$
 $= -6$ ✓

Question 10.



$$A = 60\,000 \left(1 + \frac{12\%}{12}\right)^{36} - 10\,000 \left(1 + \frac{11\%}{4}\right)^{40}$$

$$= 2\,540\,937,7183 \text{ (Sto A)} - 2\,655\,497,517 \text{ (Sto B)}$$

CP. = R 227 538,74 (5)

- (b) K(I) cost new = R 146 000 (1)
 K(II) straight line deprec. (1)
 CP(III) $110\,960 = 146\,000(1 - i^2)$

$$\frac{-6}{25} = -2i$$

$$i = \frac{6}{25 \times 2} = \frac{3}{25} = 0,12$$

$i = 12\%$ (3)

CP(IV) $A = 146\,000(1 - 7 \times 12\%)$
 $= \underline{\underline{R.23\,360}}$ (2)

[12]

Question 11.

RP (a) $f(x) = -x^2 + 2x + 3$
 RP $x = \frac{-b}{2a} = \frac{-2}{-2} = 1$. Sub $x=1$ into original.
 $f(1) = -1 + 2 + 3 = 4$. \checkmark ca. (3)

A(1; 4) \checkmark must be used
 OR $f(x) = -\sqrt{m} \{ x^2 - 2x - 3 \}$
 $= -\sqrt{m} \{ (x-1)^2 - 4 \}$
 $= -\sqrt{m} \{ (x-1)^2 + 4 \}$ TP (1, 4) \checkmark ca. (3)

CP (b) Sub $x=1$ \checkmark into $g(x) = x^2 - 4$ \checkmark a.
 $g(1) = -3$
 $\therefore AB = 4 + 3 = 7$ \checkmark a. (3)

RP (c) X root of $g(x)$ $x = -2$ \checkmark E(-2; 0)
 if nothing else correct, give 1 mark for this. X root of $f(x)$ $0 = -x^2 + 2x + 3$ \checkmark
 $(x-3)(x+1)$
 $x = -1$ or 3 . \checkmark F(3; 0) (4)
 $\therefore EF = 5$ mark \checkmark

(d) PS $f(x); g(x) < 9$
 $x \in (-\infty; -2)$ \checkmark or $x \in (-1; 2)$ \checkmark or $x \in (3; \infty)$ \checkmark
 (3)

(b) $AB = -x^2 + 2x + 3 - x^2 + 4$ \checkmark m
 $= -2x^2 + 2x + 7$
 $= -2(1)^2 + 2(1) + 7$ \checkmark 9
 $= -2 + 9$
 $= 7$ \checkmark ca

Question 12.

$$(a)(i) \quad 180 = 18 + 61 + 19 + 60 + 38 - x$$

$$x = 16.$$

$$n(\text{roke only}) = 44$$

$$P(\text{roke only}) = \frac{44}{180} = \frac{11}{45} \quad (4)$$

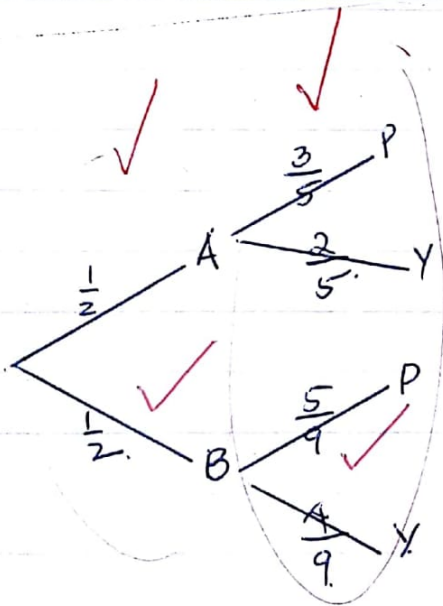
$$(ii) \quad P(2 \text{ types}) = \frac{16 + 2 + 7}{180} = \frac{25}{180} = \frac{5}{36} = 13,89\% \quad (2)$$

$$(iii) \quad P(S/F) = \frac{17}{5580} \quad (2)$$

$$(iv) \quad P((C \cap F) \cup S') = \frac{17 + 44 + 22 + 18}{180} = \frac{91}{180} \quad (2)$$

(b)(i)

RP



$$AP \quad \frac{1}{2} \times \frac{3}{5} = \frac{3}{10}$$

$$AY \quad \frac{1}{2} \times \frac{2}{5} = \frac{1}{5}$$

$$BP \quad \frac{1}{2} \times \frac{5}{9} = \frac{5}{18}$$

$$BY \quad \frac{1}{2} \times \frac{4}{9} = \frac{2}{9} \quad (5)$$

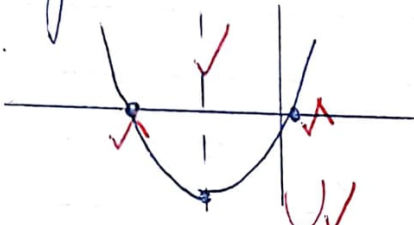
$$RP (ii) \quad P(A \cap Y) = \frac{1}{5} \quad (1)$$

$$RP (iii) \quad P(P) = \frac{3}{10} + \frac{5}{18} = \frac{26}{45} = 0,58 \quad (2)$$

[18]

Question 13

(a) PS. $y = ax^2 + bx + c$ $a > 0$ $b > 0$
 \cup Δ of S is neg
 Roots app



(3)

(b) CP. $4ac - b^2 > 0 \Rightarrow b^2 - 4ac < 0$
 (3) Roots non real (i)

(c) PS. $h(t) = -5t^2 + 13t + 6$
 2nd 9 m above cliff
 $9 = -5t^2 + 13t + 6$
 $5t^2 - 13t + 3 = 0$
 $t = 0, 2.6$ or $t = 2, 3.4$
 Yes

(4)