

Form A Paper 1 Nov.

Memo.

Section A.

Question 1.

(a)

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

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

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

$x = \frac{3}{2}$ 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 $x(x+1)(x-1)$

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

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

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

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

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

$x \neq 0$
 $x \neq \pm 1$

following correct algebra.

max 3/5 if incorrect answer

(5)

RP (iii)

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

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

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

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

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

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

check

$x = 0.$

Subst

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

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

$= \frac{8}{2}$

$(5) = 4$

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



CP
(15)

$x \in (-\infty, -\frac{1}{3})$ or $x \in (4, \infty)$ (3)

$4x^2 + 8x - 12 = 0$
 $x^2 + 2x - 3 = 0$

$x^2 + 2x = 3$

$(x+1)^2 = 4$

$x+1 = \pm 2$ *✓ Sq. root both sides*

$x = 1$ or -3

(4)

(16)
RP

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

$y = 2x - 8$ (3) Sub (3) into (2)

$x^2 - 2x(2x-8) + (2x-8)^2 = 19$ ✓ a

$x^2 - 2x^2 + 8x + 4x^2 - 32x + 64 - 19 = 0$

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

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

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

$x = 5$ or 3 ✓ ca.

$y = 2$ 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 $-1; -7; -11; p$
 $-6 \quad -4 \quad p+11$

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

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

(b) RP $2 = 2a$ $3 + b = -6$
 $a = 1$ $\checkmark a$ $b = -9$ $\checkmark ca$

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

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

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

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

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

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

RP(e) 1 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)

Question 7.

SECTION B

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

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)

$h(x) =$

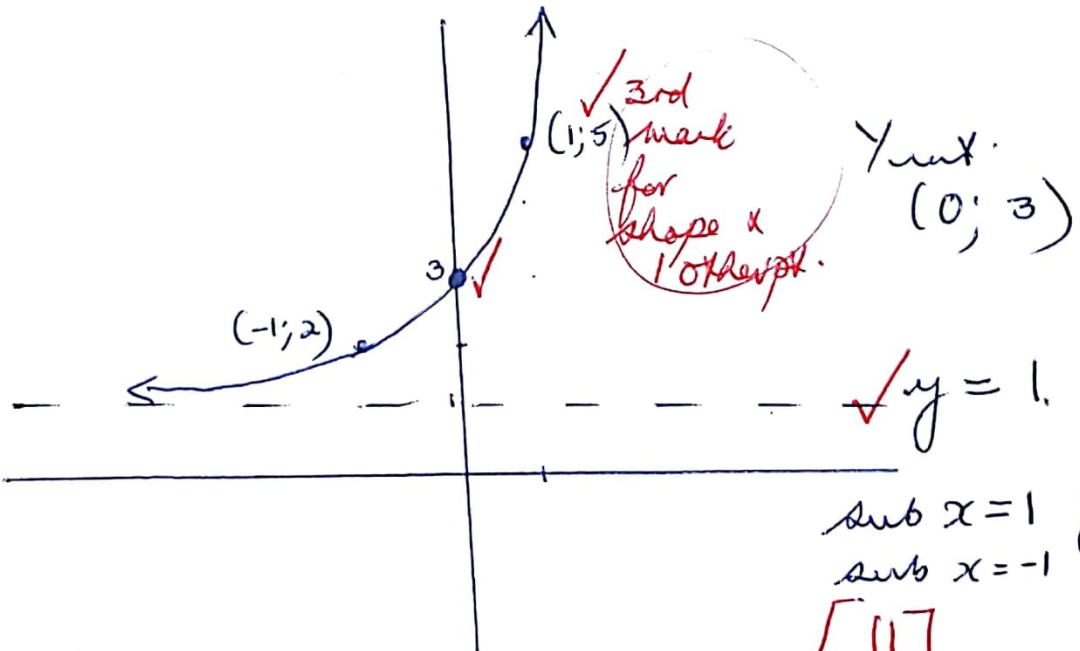
$2^{x+1-2} - 3 + 1$
 $= 2^{x-1} - 2$ ✓

OR

$h(x) = 4 \cdot 2^{x-3} - 2$ ✓

(2)

RP (e)



✓ $y = 1$ (4)

sub $x = 1$ $y = 5$
 sub $x = -1$ $y = 2$

[11]

Section B

9.

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

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

Question 9

CP: $T_2 = T_4 = 0$.

$x ; 0 ; y ; 0$

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

$y + x = -2y$

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

$x = -3y$
 $T_1 = x = 18$

$T_3 = y = -6$

(6)

$d_2 = 12$

$2a = 12$
 $a = 6$

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

$a + b + c = T_1$

$T_2 = 0 \Rightarrow 24 + 2b + c = 0$

$6 + -36 + c = T_1$

$T_4 = 0 \Rightarrow 96 + 4b + c = 0$

$6 - 36 + 48 = T_1 = 18$

$72 + 2b = 0$
 $b = -36$

$T_n = 6n^2 - 36n + c$

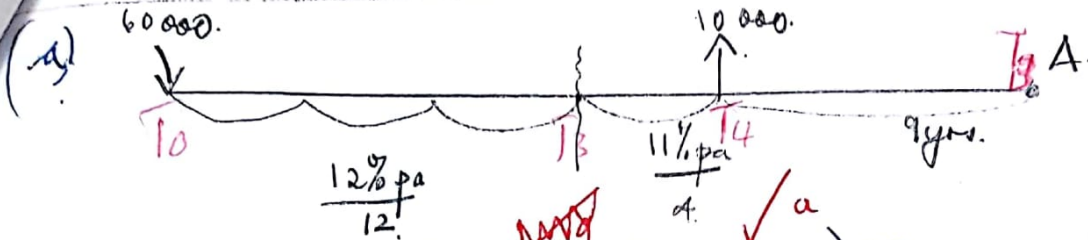
$T_2 = 24 - 72 + c = 0$

$c = 48$

$T_n = 6n^2 - 36n + 48$

$T_3 = 54 - 108 + 48 = -6$

Question 10.



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

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

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.

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

A(1; 4) ✓ must be local
 OR $f(x) = -\{x^2 - 2x - 3\}$
 $= -\{(x-1)^2 - 4\}$
 $= -(x-1)^2 + 4$ TP (1, 4)

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

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

(d) $f(x), g(x) < 0$
 $x \in (-\infty; -2)$ ✓ or $x \in (-1; 2)$ ✓ or $x \in (3; \infty)$ ✓ (3)

(b) $AB = -x^2 + 2x + 3 - x^2 + 4$
 $= -2x^2 + 2x + 7$
 $= -2(1)^2 + 2(1) + 7$
 $= -2 + 9$
 $= 7$ ✓ (3)

Question 12.

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

$$x = 16.$$

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

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

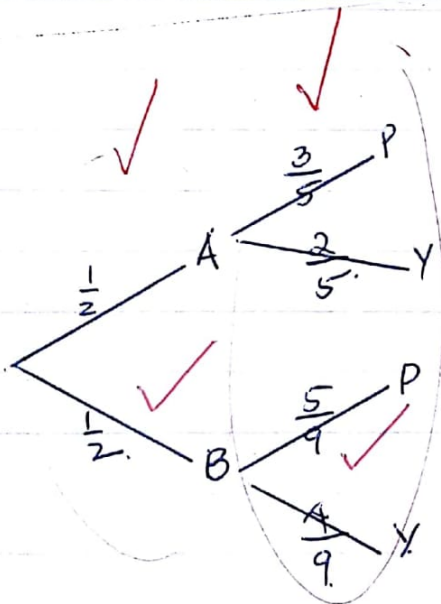
$$(ii) \quad P(2 \text{ types}) = \frac{16 + 2 + 7}{180} = \frac{25}{180} = \frac{5}{36} = 13,89\% \quad (2)$$

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

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

(b)(i)

RP



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

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

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

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

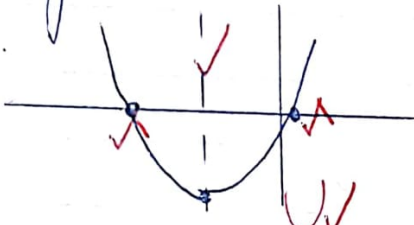
$$(ii) \quad P(A \cap Y) = \frac{1}{5} \quad (1)$$

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

[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)