Form 4 Paper 1 Nov.

Memo.

Section A.

Question 1.

(a)

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

$2x^2+5x-12 = 0$. ✓

$(2x-3)(x+4) = 0$ ✓ } must show these 2 steps to get x

$x = \frac{3}{2}$ ✓ or -4 ✓ (3)

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

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

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

$15x^2+15x - x^2-2x+3 = 12x^2-12$ ✓ca

$2x^2+13x+15 = 0$ ✓ca. following correct algebra.

$(2x+3)(x+5)$ ✓

$x = -\frac{3}{2}$ or -5 ✓ max 3/5 if incorrect (5)

RP (iii) $2x+1\sqrt{x+1} = 1$

$(\sqrt{x+1})^2 = (1-2x)^2$ ✓m

$x+1 = 1-4x+4x^2$ ✓a

$4x^2-5x = 0$ ✓a.

$x(4x-5) = 0$ ✓ca

$x = 0$ or $x = 5/4$ ✓

check

$x = 0$. ✓

Subst $x = 5/4$

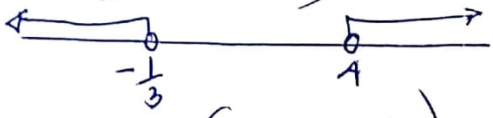
$\frac{5}{2} + \sqrt{\frac{9}{4}} = \frac{5}{2} + \frac{3}{2}$

$= \frac{8}{2}$

$= 4$ (5)

(iv) RP $-3(3x+1)(x-4) < 0$

$(3x+1)(x-4) > 0$ ✓CV and (>0)



CP $x \in (-\infty; -\frac{1}{3})$ ✓ or $x \in (4; \infty)$ ✓ (3)

(v) $4x^2 + 8x - 12 = 0$ ÷4 ✓

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

$x^2 + 2x = 3$

$(x+1)^2$ ✓ $= 4$ ✓

$x + 1 = \pm 2$ ✓ Sq. root both sides

$x = 1$ or -3 (4)

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

$y = 2x - 8$ (3) Sub (3) into (2) ✓m

$x^2 - x(2x-8) + (2x-8)^2 = 19$ ✓a

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

$3x^2 - 24x + 45$ ✓ = 0 ✓a

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

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

$x = 5$ ✓ or 3 ✓ca.

$y = 2$ or -2 ✓ca. (6)

[26]

Question 2.

(a) (i) RP. $4x^{\frac{1}{2}} \cdot (8x^3)^{-\frac{1}{3}}$

$= 2^2 x^{\frac{1}{2}} \cdot 2^{-1} \cdot x^{-1}$ ✓ ✓ ✓ a.

$= 2 \cdot x^{-\frac{1}{2}} = \frac{2}{x^{\frac{1}{2}}}$ ✓ ca ✓ ca (3)

(ii) RP. $\frac{6^{n+2} \cdot 2^{n-1}}{12^{n+2}} = \frac{2^{n+2} \cdot 3^{n+2} \cdot 2^{n-1}}{3^{n+2} \cdot 2^{2n+4}}$ ✓ ✓

$= 2^{n+2+n-1-2n-4} \cdot 3^{n+2-n-2}$ ✓ 3^0

$= 2^{-3} = \frac{1}{8}$ (3.)

(iii) RP. $\frac{3^{2x}(3+1)}{3^x(2+8)} = \frac{4}{2+8} \cdot \frac{4}{10}$ (3)

$= \frac{2}{5}$.

b) RP $2^{x+2} + 2^x = 20$ ✓m

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

$2^x \cdot 5 = 20$ ✓ca

$2^x = 2^2$ ✓ca

$x = 2$ ✓ca. [13] (4)

Question 3.

RP (a) $P(FA) = \frac{6101}{10730}$ ✓ ✓ $= 0,57$ (2)

RP (b) $P(U \text{ FA})$ $\frac{4222}{8120}$ ✓ (2)

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) $-1; -7; -11; p$

RP $-6 \quad -4 \quad p+11$

$2 = p+11+4$

$-13 = p$

$p = -13$ ✓ ✓ (1)

ans. only.

(b) RP $2 = 2a$ $\quad 3+b = -6$ $\quad 1-9+c = -1$

$a = 1$ ✓ca $\quad b = -9$ ✓ca $\quad c = 7$ ✓ca

$T_n = n^2 - 9n + 7$ [4] (3)

$a = -1$. $\quad -3+b = -6$ $\quad -1-3+c = -1$

$b = -3$. $\quad c = 3$

Question 5

(a) RP $\quad 9304,60 = 7000\left(1+\frac{i}{4}\right)^{12}$ ✓ ✓

$\sqrt[12]{\frac{9304,6}{7000}} - 1 = \frac{i}{4}$ ✓ca

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

nominal $i = 9,6\%$ p.a. ✓ compounded quarterly (4)

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

$i_{eff} = 9,95\%$ p.a. ✓ca [7] (3)

Question 6

RP(a): $x = -1$ ✓ K
$y = 1$. ✓ (2)

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

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

$2 = a$ ✓

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

RP(c) $y = x+1+1 \Rightarrow y = x + 2$ ✓ ✓ (3) (2)

RP(d) Y-intercept: $x = 0$ $y = 2 + 1 = 3$ ✓
$C(0; 3)$ Must be coordinates
X-int $y = 0$
$0 = \frac{2}{x+1} + 1$ ✓
$-x - 1 = 2$
$-x = 3$
$x = -3$. ✓ $A(-3; 0)$ (3)

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)

(f) solve $y = 2x+3$ and $y = \frac{2}{x+1} + 1$ simultaneously

CP.

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

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

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

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

$x = 0$ or $x = -2$.

Sub $x = -2$ into $y = 2x+3$. ✓ ia

$y = -1$. ✓

D $(-2; -1)$ (no need for words 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

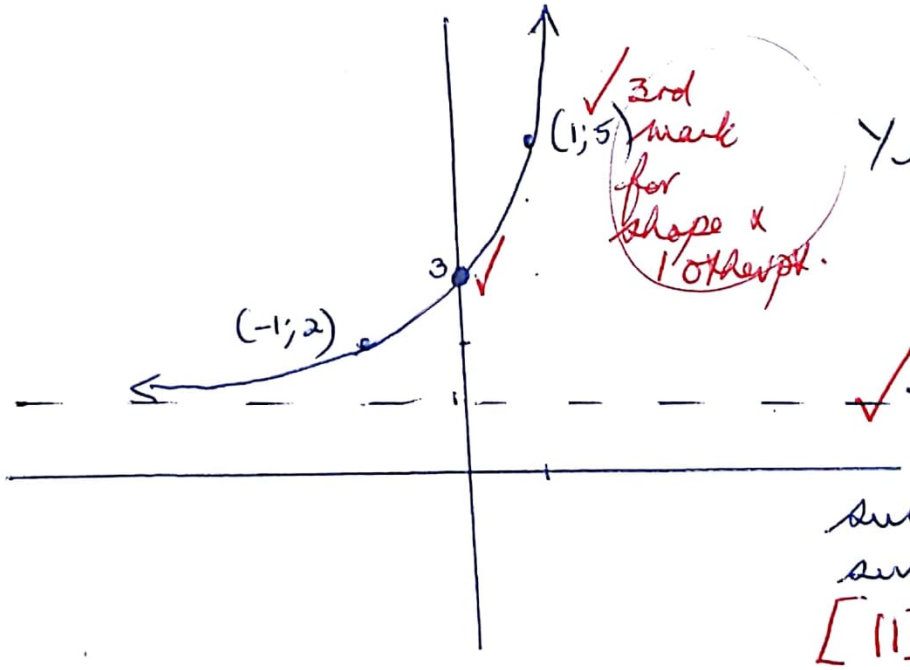
Domain $x \in \mathbb{R}$ ✓ or $-\infty < x < \infty$. (2)

CP(c) $g(x) = -2^{x+1} - 1$ ✓ ✓ CP (2) K.

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

$= 2^{x+1} - 2$ ✓ (2)

RP(e)



y-int. (0; 3)

(4)

sub $x = 1$ $y = 5$

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

[11]

Section B

Question 8

CP (a) $ax+c = px-d$

$ax - px = -c-d$ ✓

$x(a-p) = -c-d$

$x = \frac{-c-d}{a-p}$ (2)

CP (b) $(mx+1)(x-m) = 0$

$x = -\frac{1}{m}$ ✓ or $x = m$. ✓ (2)

CP (c) $-2x < 4 - 10m$

$x > -2 + 5m$. (2)

Question 9

CP $T_2 = T_4 = 0$.

$x \;;\; 0 \;;\; y \;;\; 0$

$-x \quad y \quad -y$ ✓m.

$y + x = -2y$ ✓ ✓m.

$x = -3y$.

$T_1 = x = 18$ ✓

$T_3 = y = -6$

$-2y = 12$ ✓ ca.

$y = -6$ ✓ ca.

(6)

$d_2 = 12$ $\quad 2a = 12$ ✓ $\quad a = 6$ ✓

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

$a+b+C = T_1$

$6 + -36 + C = T_1$

$6 - 36 + 48 = T_1 = 18$ ✓

$T_2 = 0 \Rightarrow 24 + 2b + C = 0$.

$T_4 = 0 \quad 96 + 4b + C = 0$ ✓

$72 + 2b = 0$

$b = -36$ ✓

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

$T_2 = 24 - 72 + C = 0$ ✓

$C = 48$.

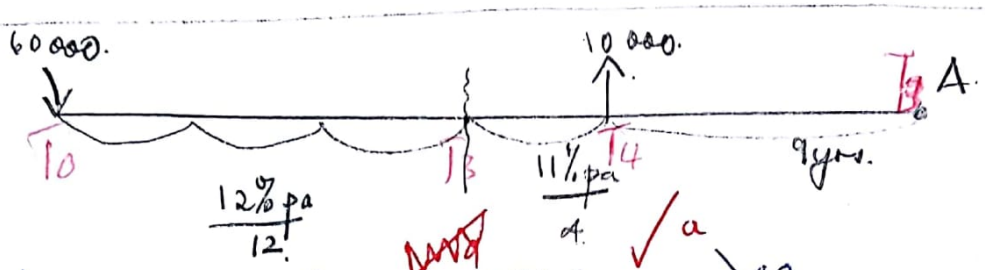
$T_n = 6n^2 - 36n + 48$

$T_3 = 54 - 108 + 48$

$= -6$. ✓

Question 10.

(a)



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

$$= 254\,093,7183 - 26\,554,97517$$

(Slo A) (Slo B)

CP. $= R227\,538,74$ a. (5)

(b) K(I) cost new is R146 000 (1)

K(II) straight line depre. (1)

CP(III) $110\,960 = 146\,000(1-i2)$

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

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

$i = 12\%$ (3)

CP(IV) $A = 146\,000(1-7\times 12\%)$

$= R23\,360$ (2)

[12]

Question 11.

(a) $f(x) = -x^2 + 2x + 3$.

RP $x = \frac{-b}{2a} = \frac{-2}{-2} = 1$. ✓m

Sub $x = 1$ into original. $f(1) = -1 + 2 + 3$ ✓ca. $= 4$.

$A(1; 4)$ ✓ca. must be coord (3)

OR $f(x) = -\{x^2 - 2x - 3\}$ ✓m

$= -\{(x-1)^2 - 4\}$ ✓m

$= -(x-1)^2 + 4$ TP $(1; 4)$ ✓ca. (3)

CP (b) Sub $x = 1$ ✓m into $g(x) = x^2 - 4$ ✓a.

$g(1) = -3$

$\therefore AB = 4 + 3 = 7$ ✓a. (3)

RP (c) X int. of $g(x)$ $x = -2$ ✓ $E(-2; 0)$

X int of $f(x)$ $0 = -x^2 + 2x + 3$ ✓

$(x-3)(x+1)$

$x = -1$ or 3. ✓ $F(3; 0)$

$\therefore EF = 5$ units ✓ (4)

If nothing else correct, give 1 mark for this

(d) PS $f(x) \cdot g(x) < 0$ ✓

$x \in (-\infty; -2)$ or $x \in (-1; 2)$ ✓ or $x \in (3; \infty)$ ✓ (3)

(b) $AB = -x^2 + 2x + 3 - x^2 + 4$ ✓m

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

$= -2(1)^2 + 2(1) + 7$ ✓sub

$= -2 + 9$

$= 7$ ✓a

Question 12.

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

$x = 16$. ✓

$n(\text{rake only}) = 44$ ✓ca

$P(\text{rake only}) = \frac{44}{180}$ ✓ca $= \frac{11}{45}$ (4)

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

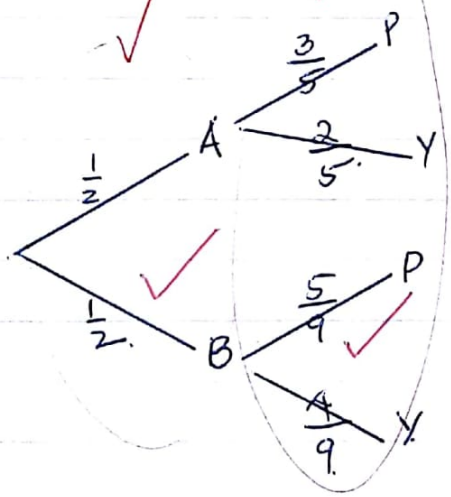
$= 13,89\%$ (2)

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

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

$= \frac{91}{180}$

(b)(i)



RP

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

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

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

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

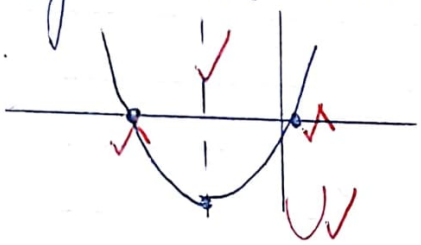
RP (ii) $P(AY) = \frac{1}{5}$ ✓ (1)

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

[18]

Question 13

(a) PS $y = ax^2 + bx + c$ $a > 0$ $b > 0$



U

Adj S us neg

Roots opp

(3)

(b) CP $4ac - b^2 > 0 \Rightarrow b^2 - 4ac < 0$

(13) Roots not real (i)

(c) PS $h(t) = -5t^2 + 13t + 6$

and 9 m above cliff

$\therefore 9 = -5t^2 + 13t + 6$

$5t^2 - 13t + 3 = 0$

$t = 0,26$ or $t = 2,34$

Yes

(4)