

GR 12 P1 PRELIM MEMO (2015)

Qu 1

(a) (i) $\frac{2x+3}{x-3} = x + \frac{9}{x-3}$

LCD: $x-3$; $x \neq 3$

$$2x+3 = x(x-3) + 9 \checkmark$$

$$2x+3 = x^2 - 3x + 9 \checkmark$$

$$0 = x^2 - 5x + 6 \checkmark$$

$$0 = (x-3)(x-2) \checkmark$$

$$\therefore x = 3 \text{ or } x = 2$$

N/A

$$\therefore \underline{x = 2} \checkmark$$

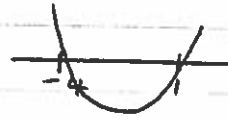
(4)

(ii) $4 - 3x - x^2 < 0$

$$x^2 + 3x - 4 > 0$$

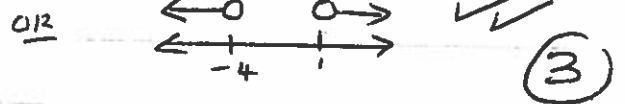
$$(x+4)(x-1) > 0 \checkmark$$

cv's: $-4; 1$



$$x \in (-\infty; -4) \cup (1; \infty)$$

OR $x < -4$ $x > 1$



(iii) $5 - \sqrt{4x+1} = x$

$$5 - x = \sqrt{4x+1} \checkmark$$

$$25 - 10x + x^2 = 4x + 1 \checkmark$$

$$x^2 - 14x + 24 = 0 \checkmark$$

$$(x-12)(x-2) = 0$$

$$x = 12 \checkmark \text{ or } x = 2 \checkmark$$

Check: $\therefore \underline{x = 2} \checkmark$

(5)

(iv) $3^x + 3 \cdot 3^x - 4 = 0$

Let $3^x = k$

$$k + 3k - 4 = 0$$

$$k^2 + 3 - 4k = 0$$

$$k^2 - 4k + 3 = 0 \checkmark$$

$$(k-3)(k-1) = 0 \checkmark$$

$$k = 3 \text{ or } k = 1$$

$$\therefore \underline{x = 1} \checkmark$$

$$\underline{x = 0} \checkmark$$

(4)

(v) $2 \log x = \log 4 + \log(x-1)$

$$2 \log x = \log 4(x-1)$$

$$2 \log x = \log 4x - 4$$

$$\log x^2 = \log 4x - 4 \checkmark$$

$$x^2 = 4x - 4$$

$$x^2 - 4x + 4 = 0 \checkmark$$

$$(x-2)^2 = 0 \therefore \underline{x = 2} \checkmark$$

(4)

Qu 2

$$a) (i) 9000 \left(1 + \frac{0,08}{4}\right)^{24} \checkmark \\ = R14\,475,94 \checkmark$$

(3)

$$(ii) 1 + i_{\text{eff}} = \left(1 + \frac{0,08}{4}\right)^4 \checkmark \\ i_{\text{eff}} = 8,24\% \checkmark \checkmark$$

(2)

$$b) \frac{10\,000 \left(1 + \frac{0,15}{12}\right)^{48} \checkmark}{2} \\ = R9\,076,77$$

$$9\,076,77 \left(1 + \frac{0,16}{4}\right)^{16} \checkmark + 9\,076,77 \left(1 + \frac{0,15}{12}\right)^{48} \checkmark \\ = R33\,478,18 \checkmark$$

(9)

$$c) 2x = x \left(1 + \frac{0,12}{12}\right)^n \checkmark \\ 2 = \left(1 + \frac{0,12}{12}\right)^n$$

$$\therefore n = \log_{\left(1 + \frac{0,12}{12}\right)} 2 \checkmark$$

$$n = 69,66 \therefore 70 \text{ months} \checkmark$$

(3)

117

Question 3

a) $2w + 3 - w - 5 = w - 7 - 2w - 3$

$$w - 2 = -w - 10 \checkmark \checkmark$$

$$w = -4$$

$$\text{c. diff: } -6 \checkmark$$

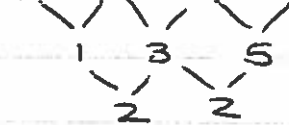
(3)

b) $r = 3$

$$T_6 = 2 \cdot 3^5 \checkmark$$
$$= 486 \checkmark$$

(2)

c) (i) $4 \quad 5 \quad 8 \quad 13$



$$2a = 2$$

$$3(1) + b = 1$$

$$a = 1 \checkmark$$

$$b = -2 \checkmark$$

$$1 - 2 + c = 4$$

$$c = 5 \checkmark$$

$$T_n = n^2 - 2n + 5 \checkmark$$

(4)

(ii) $a = 1 \quad d = 2$

$$S_8 = \frac{8}{2} [2(1) + 2(8-1)] \checkmark \checkmark$$
$$= 64 \checkmark$$

(3)

d) (i) $r = 3p \checkmark$

$$-1 < 3p < 1 \checkmark$$

$$-\frac{1}{3} < p < \frac{1}{3} \checkmark$$

(3)

(ii) $r = \frac{3}{4} \checkmark$

$$S_\infty = \frac{a}{1-r}$$

$$= \frac{1}{1-\frac{3}{4}} = 4 \checkmark$$

(2)

e) $2(1) - 1 = 1$

$$2(2) - 1 = 3$$

$$\text{c. diff} = 2$$

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

$$1089 = \frac{n}{2} [2(1) + 2(n-1)] \checkmark \checkmark$$

$$2178 = n(2 + 2n - 2)$$

$$2178 = 2n^2 \checkmark$$

$$1089 = n^2$$

$$33 = n \checkmark$$

(4)

Question 4

a) (i) $y = \frac{12}{x+2} - 5$ ✓ (2)

(ii) $(-2; -5)$ ✓ $m=1$ ✓ OR $(-2; -5)$ $m=-1$ ✓
 $y = x - 3$ ✓ $y = -x - 7$ (3)

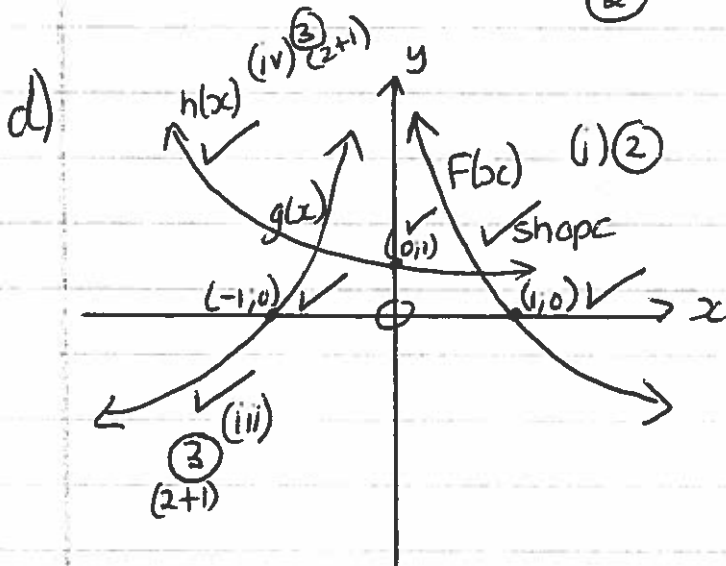
b) (i) $y = (0-2)^2$ $y = 2^0 - 4$
 $y = 4$ $y = -3$
 $\therefore A(0; 4)$ ✓ $\therefore C(0; -3)$ ✓ $B(2; 0)$ (3)

(ii) $y = -4$ ✓ (1) (iii) $h(x) = f(2x) + 4$
 $= (2x-2)^2 + 4$ (2)

(iv) $x = (2y-2)^2 + 4$ ✓
 $x-4 = (2y-2)^2$
 $\pm\sqrt{x-4} = 2y-2$ ✓
 $\pm\sqrt{x-4} + 2 = 2y$
 $\frac{\pm\sqrt{x-4} + 2}{2} = y$ $\therefore h^{-1}(x) = \frac{\pm\sqrt{x-4} + 2}{2}$ ✓ (3)

c) (i) Yes ✓ For every possible x-value there is only 1 y-value ✓ (2)

(ii) $y \in (-\infty; 6]$ ✓ (2) (iii) $f(3) = 2$ ✓ (1)



(ii) $x > 0; y \in \mathbb{R}$ ✓
 (iii) $g(x) = \log_{1/3}(-x)$ ✓

(iv) $h(x) = (\frac{1}{3})^x$ ✓

(10)

Question 5

$$a) \lim_{x \rightarrow 1} \frac{(x+2)(x-1)}{-(x-1)} \checkmark$$

$$= \lim_{x \rightarrow 1} -(x+2) \checkmark$$

$$= -(1+2) = -3 \checkmark$$

(3)

$$b) F(x) = -2x^2 + 3x$$

$$F(x+h) = -2(x+h)^2 + 3(x+h)$$

$$= -2x^2 - 4xh - 2h^2 + 3x + 3h \checkmark \checkmark$$

$$F'(x) = \lim_{h \rightarrow 0} \frac{F(x+h) - F(x)}{h}$$

$$= \lim_{h \rightarrow 0} \frac{-2x^2 - 4xh - 2h^2 + 3x + 3h + 2x^2 - 3x}{h} \checkmark$$

$$= \lim_{h \rightarrow 0} \frac{-4xh - 2h^2 + 3h}{h}$$

$$= \lim_{h \rightarrow 0} -4x - 2h + 3 \checkmark$$

$$F'(x) = -4x + 3 \checkmark$$

(5)

$$c) D_x \left[\frac{x^{2/3} - 3x^{1/3} + 1}{x^{1/3}} \right]$$

$$= D_x [x^{1/3} - 3 + x^{-1/3}] \checkmark \checkmark$$

$$= \frac{1}{3} x^{-2/3} - \frac{1}{3} x^{-4/3}$$

$$= \frac{1}{3x^{2/3}} - \frac{1}{3x^{4/3}} \checkmark \checkmark$$

(4)

d) (i) x -ints: -1 & 2
 $(0; 2)$ $(2; 0)$ $(-1; 0)$

$$y = a(x-2)(x+1)(x+1) \checkmark \checkmark$$

$(0; 2)$

$$2 = a(-2)(1)(1)$$

$$-1 = a \checkmark$$

$$\therefore y = -(x-2)(x^2+2x+1) \checkmark$$

$$y = -(x^3 + 2x^2 + x - 2x^2 - 4x - 2)$$

$$y = -x^3 + 3x + 2 \checkmark$$

(5)

$$\therefore a = -1 \text{ \& } b = 3$$

(ii) $F'(x) = -3x^2 + 3 \checkmark$

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

$$0 = -3(x^2 - 1)$$

$$0 = (x+1)(x-1) \checkmark$$

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

$$F(1) = -(1)^3 + 3(1) + 2$$
$$= 4$$

$$\therefore B(1; 4) \checkmark$$

(5)

(iii) $-1 < x < 1 \checkmark \checkmark$

(2)

e) (i) $0 \checkmark$

(ii) $0 \checkmark$

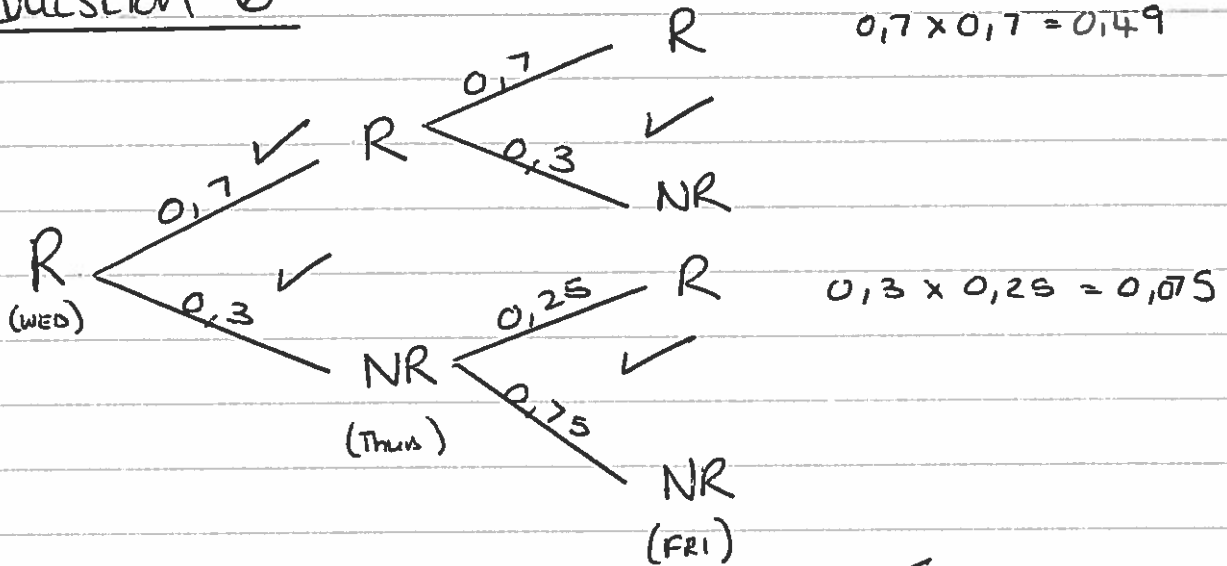
(iii) positive \checkmark

(iv) positive \checkmark

(4)

Question 6

a)



Chance of rain: $0,49 + 0,075$
 $= 0,565$ (56,5%)
(6)

b) $21 \times 21 \times 10 \times 10 \times 21 \times 21$
 $= 19\,448\,100$
(3)

c) (i) $5! = 120$
(2)

(ii) $3! \cdot 3! = 36$
 \therefore Probability $\frac{36}{120} = \frac{3}{10}$ (30%)
(4)

15

Question 7

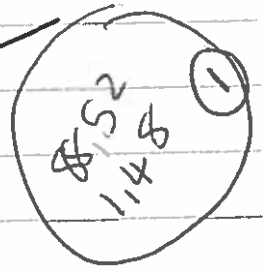
a) (i) $\frac{dy}{dx} = -0,000264x + 0,01188$ ✓

$0 = -0,000264x + 0,01188$

$x = 45$ ✓

\therefore width is 90m ✓

(4)



(ii) $y = -0,000132(45)^2 + 0,01188(45) - 0,0173$
 $= 0,25$

\therefore height is 0,25m ✓✓

(3)

(iii) $-0,000264(60) + 0,01188$
 $= -0,00396$ ✓

(2)

b) (i) $50 + 5x$ ✓✓

(2)

(ii) $(50 + 5x)(300 - 10x)$ ✓✓

(2)

(iii) $15000 - 500x + 1500x - 50x^2$
 $= 15000 + 1000x - 50x^2$

$\therefore 1000 - 100x = 0$ ✓✓

$1000 = 100x$

$10 = x$

(10 weeks)

✓

(4)