

Form 5 Prelim Paper 1 2016

Section A

Question 1

(a) (1) $3x(x-11) = -30$

$3x^2 - 33x + 30 = 0$ ✓

$x^2 - 11x + 10 = 0$

$(x-10)(x-1) = 0$

$x = 10$, ✓ or $x = 1$ ✓

(3)

(2) $x^2 - 3x - 7 = 0$

$x = -1,5$ ✓ or $x = 4,5$ ✓

(2)

(3) $2^{2x+2} + 7 \cdot 2^x = 2$

$2^{2x} \cdot 2^2 + 7 \cdot 2^x - 2 = 0$ ✓

$(4 \cdot 2^{2x} - 1)(2^x + 2) = 0$ ✓

$2^{2x} = \frac{1}{4}$ ✓ or $2^{2x} = -2$

$2^x = 2^{-2}$

N/A ✓

(5)

$x = -2$ ✓

(b) $\frac{3^{3x}}{9^y} = 243$

$2^x \cdot 4^{y-1} = 32$

$2^{x+2y-2} = 2^5$ ✓

$3^{3x-2y} = 3^5$ ✓

$x+2y = 7$ --- (2) ✓

$3x-2y = 5$ --- (1) ✓

$\therefore x = 7 - 2y$ --- (3)

$3(7-2y) - 2y = 5$

$21 - 6y - 2y = 5$

$-8y = -16$ ✓

$y = 2$ ✓

$x = 3$ ✓

(6)

Question 2

(a) 5; 12; 21; 32; ...

(1) $\underline{45}$ ✓

(1)

(2) 5; 12; 21; 32

$\underbrace{\quad}_7 \quad \underbrace{\quad}_9 \quad \underbrace{\quad}_{11}$

$\underbrace{\quad}_2 \quad \underbrace{\quad}_2$

$a = 1$

$3a + b = 7$

$b = 4$ ✓

$a + b + c = 5$

$c = 0$ ✓

$\therefore T_n = \underline{n^2 + 4n}$ ✓

(4)

(b) (1) $T_5 = 1000(1 + 0,07)^4$
 $= \underline{1310,80}$ ✓

$\therefore \% \text{ growth} = \frac{1310,8 - 1000}{1000} \times 100$

$= \underline{31,1\%}$ ✓

(2)

(a) $2000 = 1000(1,07)^{n-1}$ ✓

$\log 2 = \log(1,07)^{n-1}$ ✓

$\frac{\log 2}{\log 1,07} = n - 1$

$\log 1,07$

$n = 11,24$

$\therefore \underline{12 \text{ years}}$ ✓

(3)

Question 3

(a) $f(x) = x^2 - 5x + c$

$$\begin{aligned} b^2 - 4ac &= 41 \\ (-5)^2 - 4(1)(c) &= 41 \\ -4c &= 16 \\ \underline{c} &= \underline{-4} \end{aligned}$$

(4)

(b) $k^2x^2 = 4kx - 4$

$$k^2x^2 - 4kx + 4 = 0$$

For equal roots $\Delta = 0$

$$\begin{aligned} \therefore \Delta &= (-4k)^2 - 4(k^2)(4) \\ &= 16k^2 - 16k^2 \\ &= 0 \end{aligned}$$

\therefore Roots are real and equal.

(4)

(c) $x^2 + 2a(x+1) - (x-2) = 0$

For unequal roots $\Delta > 0$

$$x^2 + 2ax + 2a - x + 2 = 0$$

$$x^2 + (2a-1)x + 2a+2 = 0$$

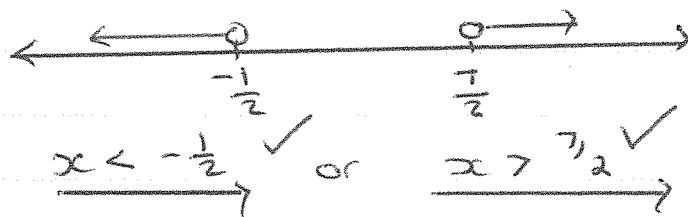
$$(2a-1)^2 - 4(1)(2a+2) > 0$$

$$4a^2 - 4a + 1 - 8a - 8 > 0$$

$$4a^2 - 12a - 7 > 0$$

$$(2a-7)(2a+1) > 0$$

$$\text{C.V. } 7/2, -1/2$$



(6)

Question 4

(a) $F(x) = 2x - x^2$

$$F'(x) = \lim_{h \rightarrow 0} \frac{2(x+h) - (x+h)^2 - (2x - x^2)}{h}$$

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

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

$$= \lim_{h \rightarrow 0} \frac{h(2 - 2x - h)}{h}$$

$$= \underline{2 - 2x} \quad (5)$$

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

$$= D_x \left[\frac{(x-3)(x+1)}{x+1} \right]$$

$$= D_x [x - 3]$$

$$= 1$$

(2) $y = \frac{4}{3x} - \frac{x^3}{6} + \frac{\sqrt{x}}{x}$

$$y = \frac{4}{3}x^{-1} - \frac{1}{6}x^3 + x^{-\frac{1}{2}}$$

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

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

(5)

(3) $xy - 5 = \sqrt{x^3}$

$$y = \frac{x}{x^{3/2}} + 5$$

$$y = x^{\frac{1}{2}} + 5x^{-\frac{1}{2}}$$

$$\therefore \frac{dy}{dx} = \frac{1}{2x^{1/2}} - \frac{5}{2x^{3/2}}$$

(5)

Question 5

(a) $A(-5; 11)$

(1) $A(-5; 22)$

(2) $A(5; 11)$

(4)

(b) separate sheet

(c) (1) $y = 0: 0 = 2^x - 8$ ✓
 $2^3 = 2^x$ ✓
 $x = 3$ ✓
 $\therefore A(3; 0)$ ✓

$x = 0: y = 2^0 - 8$ ✓
 $y = -7$ ✓
 $B(0; -7)$ ✓

(2) $y = -8$ ✓

(3) $h(x) = 2^{2x}$ ✓✓

(4) $h^{-1}(x) = \log_2 x$ ✓✓

(5) $p(x) = -\log_2 x$ ✓

(6) $\sum_{k=0}^3 g(k) - \sum_{k=4}^5 g(k)$

$= g(0) + g(1) + g(2) + g(3) - (g(4) + g(5))$

$= g(0) + g(3)$ ✓

$= \underline{4, 5}$ ✓

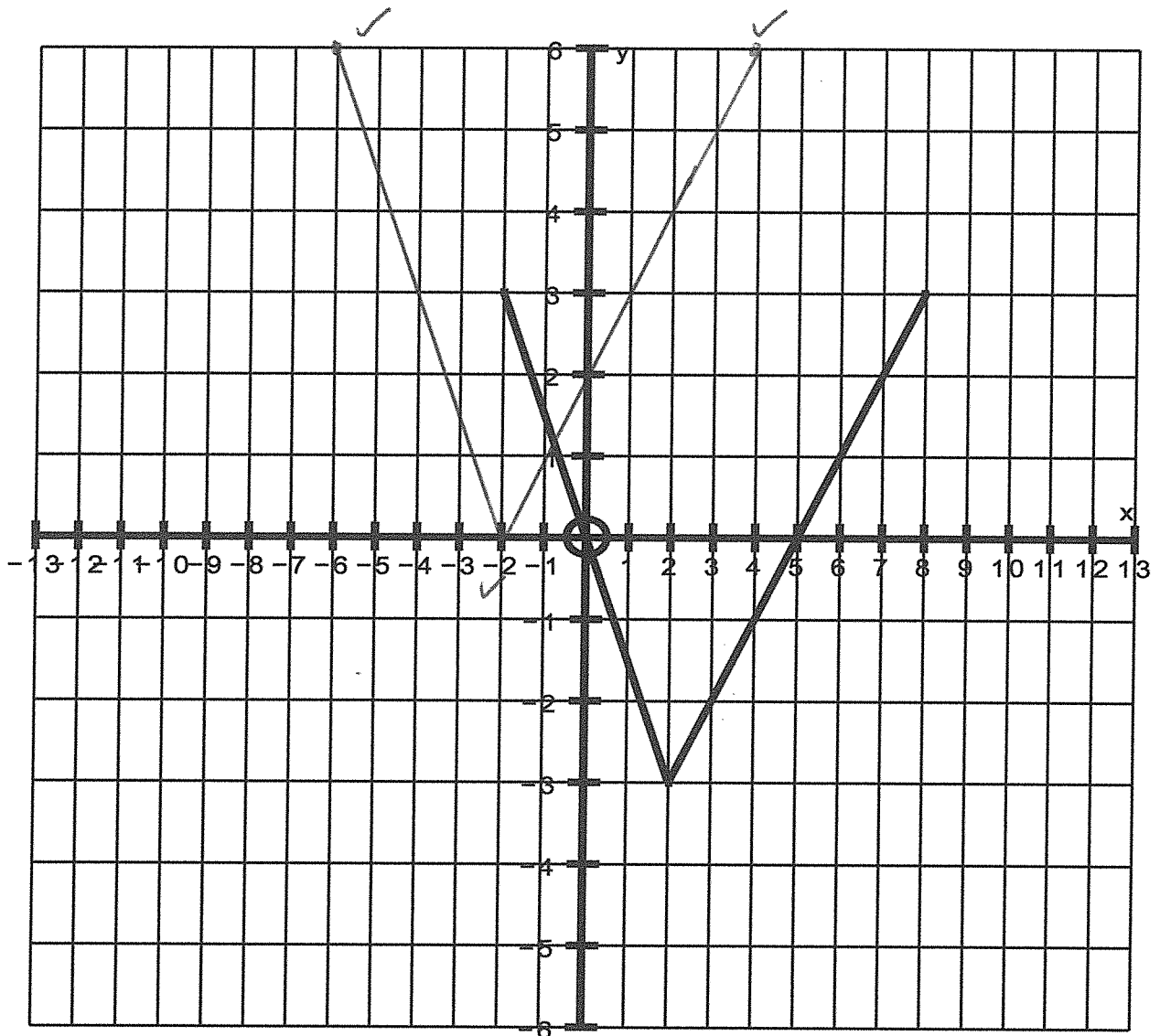
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PRELIM EXAMINATION 2016 – MATHEMATICS FORM 5 PAPER 1
ANSWER SHEET QUESTION 5(B)

Name: Memo



(3)

Section B

Question 6

$$A = 28000 \left(1 + \frac{0,075}{12}\right)^{15}$$
$$= R30743,01 - R5500$$

$$A = 25243,01 \left(1 + \frac{0,075}{12}\right)^9$$
$$= 26698,95 + R12000$$

$$A = 38698,95 \left(1 + \frac{0,075}{12}\right)^{24}$$
$$= \underline{R44940,79} \rightarrow$$

(12)

Question 7

(a) $f(x) = \frac{1}{900}x^3 - \frac{1}{5}x^2 + 9x$

(1) $f'(x) = 0$ ✓

$\therefore \frac{1}{300}x^2 - \frac{2}{5}x + 9 = 0$ ✓

$x = 90$ ✓

or

$x = 30$ ✓

$\therefore \underline{B(90; 0)}$ ✓

$\underline{A(30; 120)}$ ✓

(6)

(2) $C(150; 600)$ ✓

$m = \frac{600 - 120}{150 - 30}$ ✓

$= 4$ ✓

(3)

(3) $f''(x) = 0$

$\frac{1}{150}x - \frac{2}{5} = 0$ ✓

$x = 60$

$\therefore \underline{(60; 60)}$ ✓

(2)

(b) Point $(1, 3)$ ✓ $m = \frac{2}{3}$ ✓

$y - 3 = \frac{2}{3}(x - 1)$ ✓

$\therefore y = \frac{2}{3}x + \frac{7}{3}$ ✓

(5)

(c) $q(x) = 2x - 3$

$s(x) = x^2 - 3$

$q'(x) = 2$ ✓

$s'(x) = 2x$ ✓

$\therefore 2 > 2x$

$\underline{x < 1}$ ✓

(3)

Question 8

$$(a) \text{ Sub } (1, 5) : 5 = a + b \quad \checkmark \text{ --- } (1)$$

$$F'(1) = 12 \quad \checkmark$$

$$3ax^2 + 2bxc = 12 \quad \checkmark$$

$$3a + 2b = 12 \quad \text{--- } (2)$$

$$\text{Sub } a = 5 - b \text{ into } (2)$$

$$3(5 - b) + 2b = 12 \quad \checkmark$$

$$15 - 3b + 2b = 12$$

$$-b = -3$$

$$\underline{b = 3} \quad \checkmark$$

$$\underline{a = 2} \quad \checkmark$$

(6)

$$(2) \quad F'(x) = 0 \quad \checkmark$$

$$3(2)x^2 + 2(3)x = 0$$

$$6x(x + 1) = 0 \quad \checkmark$$

$$\underline{x = 0} \quad \checkmark \text{ or } \underline{x = -1} \quad \checkmark$$

(3)

(b) Let x be the one number

\therefore other number = $24 - x$ \checkmark

$$x(24 - x)^2 \quad \checkmark$$

$$= x(576 - 48x + x^2)$$

$$= 576x - 48x^2 + x^3$$

$$D_x = 0$$

$$576 - 96x + 3x^2 = 0 \quad \checkmark$$

$$x^2 - 32x + 192 = 0$$

$$(x - 24)(x - 8) = 0$$

$$x = 24 \quad \checkmark \text{ or } x = 8$$

N/A

(6)

\therefore The numbers are 8 and 16 \checkmark

Question 9

(a) $P(A) = 0,5$ $P(B) = 0,3$ $P(A \cup B) = 0,65$

$\therefore P(A) + P(B) = 0,8 \checkmark$

$\therefore P(A \cap B) = 0,15 \checkmark$

$P(A) \times P(B) = 0,15 \checkmark$

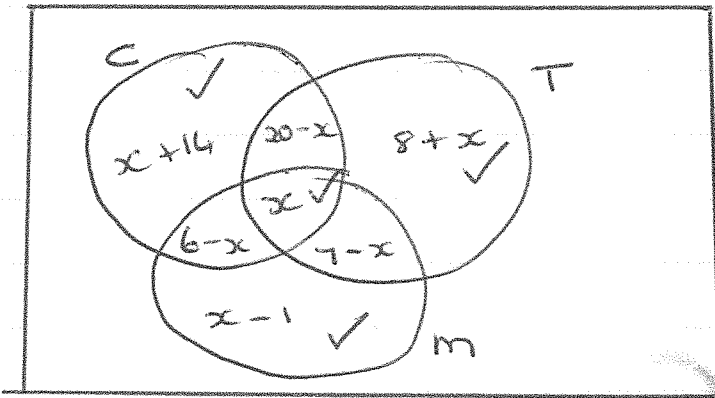
$= P(A \cap B)$

\therefore Independent \checkmark

(4)

(b)

$S = 60$



$x+14 + 6-x + x-1 + x + 20-x + 7-x + 8+x = 60 \checkmark$

$x = 6$ \rightarrow \checkmark

(6)

Question: 10

(a) $a = 8$

$d = 1$

$S_p = 8p + 15$

$\frac{p}{2} [2(8) + (p-1)(1)] = 8p + 15.$

$p[16 + p - 1] = 16p + 30$

$p^2 - p - 30 = 0$

$(p-6)(p+5) = 0$

$p = 6$ or $p = -5$
N/A

$\therefore p = 6$

\therefore Number of log in the stack

$= 8(6) + 15$

$= \underline{63}$

(5)

b) $T_1 = 2$

$T_3 = 2 + 2d$

$T_7 = 2 + 6d$

$\frac{2+6d}{2+2d} = \frac{2+2d}{2}$

$4 + 12d = 4 + 8d + 4d^2$

$0 = 4d^2 - 4d$

$0 = d(4d - 4)$

$d = 0$ or $d = 1$

$\therefore T_2 = 2$ or $T_2 = 4$

(6)

Question 11

Throws % hits no of hits.

n

p

$n \times \frac{p}{100}$ ✓

$n+1$

$p+1$

$\frac{(n+1)(p+1)}{100}$ ✓

$$\therefore \frac{np}{100} + 1 = \frac{(n+1)(p+1)}{100}$$

$$np + 100 = np + n + p + 1 \quad \checkmark$$

$$\underline{99 = n + p} \quad \checkmark$$

(5)
