

# Matric June Paper 1 2016 Memo

## Question 1

(a) (1)  $x = 2$  ✓ A or  $x = -\frac{3}{2}$  ✓ A

(2)  $2x^2 - 5x - 3 \leq 0$

$(2x + 1)(x - 3) \leq 0$  ✓ M

cv:  $-\frac{1}{2}$  ; 3

$\begin{array}{c} + \quad - \quad + \\ \hline -\frac{1}{2} \quad 3 \end{array}$  ✓ M

$-\frac{1}{2} \leq x \leq 3$  ✓ A

(b) (1)  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \frac{2 \pm \sqrt{(-2)^2 - 4(3)(-14)}}{2(3)}$  ✓ M

$x = 2,52$  or  $x = -1,85$   
✓ A ✓ A

(b) (a)  $2^{2x} - 6 \cdot 2^x = 16$

Let  $k = 2^x$

$k^2 - 6k - 16 = 0$  ✓ M

$(k - 8)(k + 2) = 0$  ✓ M

$k = 8$  or  $k = -2$

$2^x = 2^3$  or  $2^x \neq -2$  ✓ M

$x = 3$  ✓ A

(c) (1)  $k = -2$  ✓ A or  $k = 2$  ✓ A

(2)  $k = -3$  ✓ A

Question 2

(a)  $1; \frac{3}{4}; \frac{5}{9}; \frac{7}{16}; \frac{9}{25}; \dots \frac{2n-1}{n^2} \checkmark A$

(b) 
$$\left. \begin{aligned} T_2 &= ar = 18 \\ T_6 &= ar^5 = \frac{32}{9} \end{aligned} \right\} \checkmark M$$

$$\frac{ar^5}{ar} = \frac{\frac{32}{9}}{18} \checkmark M$$

$$r^4 = \frac{16}{81}$$

$$r = \pm \frac{2}{3} \checkmark A$$

$$a = \pm 27 \checkmark A$$

(c)  $-11 -4 +3 + \dots + 220$

$a = -11 \quad T_n = a + (n-1)d$

$d = 7 \quad 220 = -11 + (n-1)7 \checkmark M$

$n = ? \quad 220 = -11 + 7n - 7$

$238 = 7n$

$34 = n \checkmark A$

$S_{34} = \frac{34}{2} [-11 + 220] \checkmark M$

$= 3553 \checkmark A$

$(OR) S_{34} = \frac{34}{2} [2(-11) + 33(7)]$

$= 3553$

(2)

$$\sum_{n=1}^{34} 7n - 18 \checkmark A$$

### Question 3

$$(a) (1) \quad x_{TP} = \frac{-(-7)}{2(-3)}$$
$$= -\frac{7}{6} \quad \checkmark \quad M$$

$$y_{TP} = -3\left(-\frac{7}{6}\right)^2 - 7\left(-\frac{7}{6}\right) - 2 \quad \checkmark \quad M$$

$$y_{TP} = \frac{25}{12}$$

$$\left(-\frac{7}{6}; \frac{25}{12}\right) \checkmark \quad A$$

$$(2) \quad \tan 135^\circ = -1 \quad \therefore \text{gradient at } T = -1$$

$$f'(x) = -6x - 7$$

$$A \quad \checkmark \quad -1 = -6x - 7 \quad \checkmark \quad M$$

$$6x = -6$$

$$x = -1$$

$$y = -3(-1)^2 - 7(-1) - 2 \quad \checkmark \quad M$$

$$= -3 + 7 - 2$$

$$= 2$$

$$T(-1; 2) \quad \checkmark \quad A$$

$$(3) \quad y - 2 = 1(x + 1) \quad \checkmark \quad M$$

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

$$y = -x + 1 \quad \checkmark \quad A$$

### Question 3

(b) (1)  $9 = a^2$  ✓ M  
 $3 = a$  ✓ A

(2)  $x = 3^y$  ✓ M  
 $y = \log_3 x$  ✓ A  
 $f^{-1}(x) = \log_3 x$  ✓ M

(3)  $y = \log_3(-x)$

$h(x) = \log_3(-x)$  ✓✓ for  $x < 0$  A A

### Question 4

(a)  $A = P(1 - i)^n$   
 $A = 1200000(1 - 11\%)^6$  ✓ M  
 $A = 2596377.55$  ✓ A

(b)  $A = P(1 + i)^n$   
 $= 1200000(1 + 6.9\%)^6$  ✓ M  
 $= 21790801.62$  ✓ A

(c)  $FV = 1790801.62 - 596377.55$   
 $= 1194424.07$  ✓ M  
 $FV = x \left[ \frac{(1 + i)^n - 1}{i} \right]$  ✓ M  
 $119424.07 = x \left[ \frac{\left(1 + \frac{8\%}{12}\right)^{72} - 1}{\frac{8\%}{12}} \right]$  ✓ A  
 $212979.30 = x$  ✓ A

Question 5

$$\begin{aligned}
 (a) \quad f'(x) &= \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} && \checkmark \quad M \\
 &= \lim_{h \rightarrow 0} \frac{-4(x+h) - (x+h)^2 + 4x + x^2}{h} && \checkmark \quad M \\
 &= \lim_{h \rightarrow 0} \frac{-4x - 4h - x^2 - 2xh - h^2 + 4x + x^2}{h} && \checkmark \quad M \\
 &= \lim_{h \rightarrow 0} \frac{-4h - 2xh - h^2}{h} \\
 &= \lim_{h \rightarrow 0} \frac{h(-4 - 2x - h)}{h} && \checkmark \quad M \\
 &= -4 - 2x \quad \text{as } h \rightarrow 0 && \checkmark \quad A
 \end{aligned}$$

$$\begin{aligned}
 (b) \quad (1) \quad y &= -3x^2 - \sqrt{x} + \frac{1}{x} \\
 y &= -3x^2 - x^{\frac{1}{2}} + x^{-1} && \checkmark \quad M \\
 \frac{dy}{dx} &= -6x - \frac{1}{2}x^{-\frac{1}{2}} - x^{-2} \\
 &= -6x - \frac{1}{2\sqrt{x}} - \frac{1}{x^2} \\
 &\quad \checkmark \quad \checkmark \quad \checkmark \\
 &\quad A \quad A \quad A
 \end{aligned}$$

$$\begin{aligned}
 (b) \quad (2) \quad f(x) &= \frac{x^3 + 1}{(x+1)} \\
 f(x) &= \frac{(x+1)(x^2 - x + 1)}{(x+1)} && \checkmark \quad M \\
 f(x) &= x^2 - x + 1 && \checkmark \quad M \\
 f'(x) &= 2x - 1 && \checkmark \quad A
 \end{aligned}$$

### Question 5

(c)  $g'(x) = -3x^2 + 3$   
 $A \frac{8}{3} \checkmark = -3x^2 + 3 \checkmark M$

$8 = -9x^2 + 9$

$9x^2 = 1 \checkmark M$   
 $x^2 = \frac{1}{9} \checkmark M$

$x = \pm \frac{1}{3} \checkmark A$

or  $9x^2 - 1 = 0$   
 $(3x - 1)(3x + 1) = 0$

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

### Question 6

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

(b)  $g(0) = \frac{6}{0+2} - 1 \checkmark M$        $0 = \frac{6}{x+2} - 1 \checkmark M$   
 $= 2$

$x+2 = 6$

$x = 4$

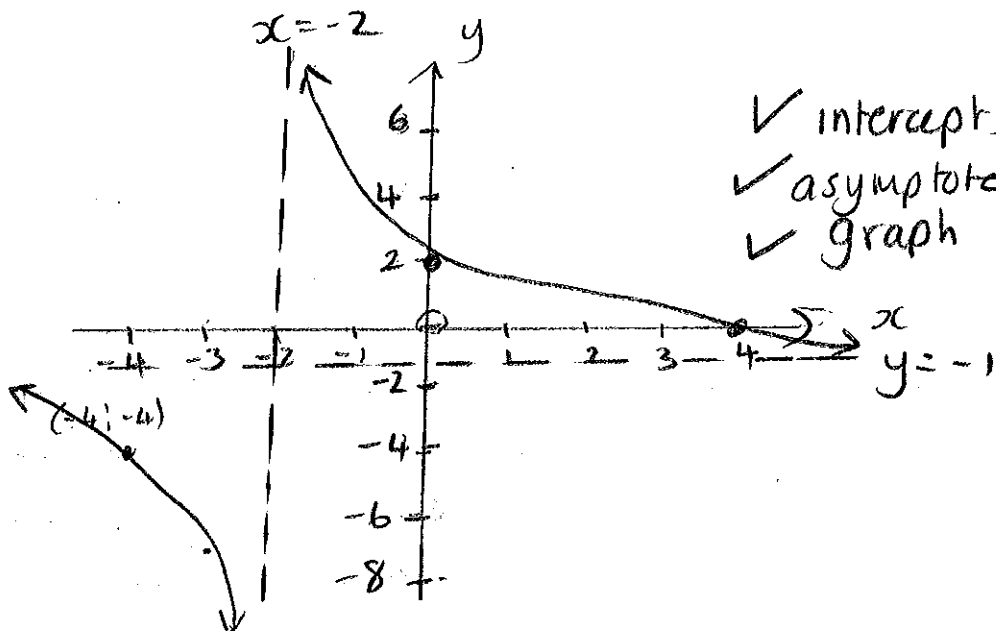
$(0, 2) \checkmark$

A

$(4, 0) \checkmark$

A

c)



$\checkmark$  intercepts A  
 $\checkmark$  asymptotes A  
 $\checkmark$  graph A

## Question 6

d)

$$y = -x + q$$
$$-1 = -(-2) + q$$
$$-3 = q$$
$$y = -x - 3$$

✓          ✓  
A          A

e)

$$x > -2$$

✓          A

○

# Question 7

(a) (1)  $4; 9; x; 37$

1st  
diff

$5 \quad x-9 \quad 37-x$

2nd  
diff

$x-14 \quad 37-x-x+9$

$x-14 = 46-2x \quad M$

$3x = 60$

$x = 20 \quad A$

(2)  $4; 9; 20; 37$

$5 \quad 11 \quad 17$   
 $6 \quad 6$

$2a = 6$

$a = 3 \quad M$

$3a + b = 5$

$9 + b = 5$

$b = -4 \quad M$

$a + b + c = 4$

$3 - 4 + c = 4$

$c = 5 \quad M$

$T_n = 3n^2 - 4n + 5 \quad A$

(b) (1)  $-1 < 4k - 3 < 1 \quad M$

$2 < 4k < 4 \quad M$

$\frac{1}{2} < k < 1 \quad A$

(2)  $T_1 = \frac{1}{5} \quad T_2 = \frac{1}{25} \quad T_3 = \frac{1}{125} \quad \therefore r = \frac{1}{5} \quad A$

$S_{\infty} = \frac{\frac{1}{5}}{1 - \frac{1}{5}} \quad M$

$S_{\infty} = \frac{1}{4} \quad A$



## Question 8

(a)  $c = -2$  ✓ A

$$\frac{dy}{dx} = 3ax^2 + 2bx$$

$$0 = 3a(-1)^2 + 2b(-1) \quad \checkmark M$$

$$0 = 3a - 2b \quad \checkmark M$$

○  $-1 = a(-1)^3 + b(-1)^2 - 2 \quad \checkmark M$

$$-1 = -a + b - 2$$

$$a = b - 1 \quad \checkmark M$$

$$0 = 3(b-1) - 2b$$

$$0 = 3b - 3 - 2b$$

$$3 = b \quad \checkmark A$$

$$a = 3 - 1$$

$$a = 2 \quad \checkmark A$$

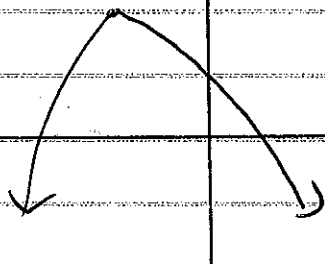
○ (b) (1)  $f'(0) = -4$  ✓ A

(2)  $x < -1$  ✓ A

(3)

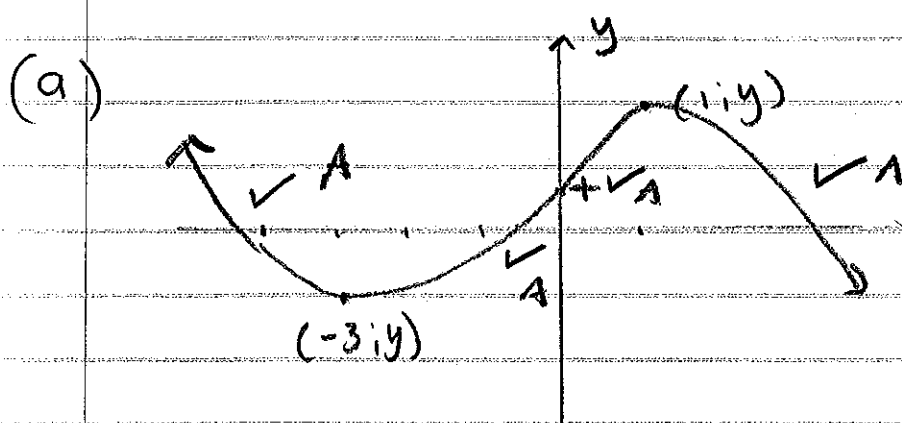
$(-1, 4)$

y



✓ shape A

## Question 9



(b) (1)  $PS^2 = 2x^2$  Pythag. ✓ M  
 $PS = \sqrt{2}x$  ✓ M  
 $PQ^2 = (50-x)^2 + (50-x)^2$  Pythag ✓ M  
 $PQ^2 = 2(50-x)^2$   
 $PQ = \sqrt{2}(50-x)$  ✓ M

$$\begin{aligned} \text{Area} &= \sqrt{2}x \times \sqrt{2}(50-x) \quad \checkmark \text{ M} \\ &= 2x(50-x) \\ &= 100x - 2x^2 \end{aligned}$$

(2)  $\frac{dA}{dx} = 100 - 4x$

$$100 - 4x = 0 \quad \checkmark \text{ M}$$

$$x = 25 \quad \checkmark \text{ A}$$

$$f''(A) = -4 \quad \therefore \text{local max}$$

$$\begin{aligned} A &= 100(25) - 2(25)^2 \\ &= 2500 - 1250 \\ &= 1250 \text{ cm}^2 \quad \checkmark \text{ A} \end{aligned}$$

# Question 10

$$(a) \text{ SP} = 120000 \div 15\% \\ = 2800000 \quad \checkmark \quad A$$

$$(b) 680000 \overset{\checkmark A}{=} x \left[ \frac{1 - \left(1 + \frac{9,25\%}{12}\right)^{-240 \overset{\checkmark A}{}}}{\frac{9,25\%}{12}} \right] \checkmark A$$

$$\overset{\checkmark A}{6227,89} = x$$

$$(c) B = 6227,89 \left[ \frac{1 - \left(1 + \frac{9,25\%}{12}\right)^{-155 \overset{\checkmark A}{}}}{\frac{9,25\%}{12}} \right] \checkmark M$$

$$B = R562200,88 \quad \checkmark \quad A$$

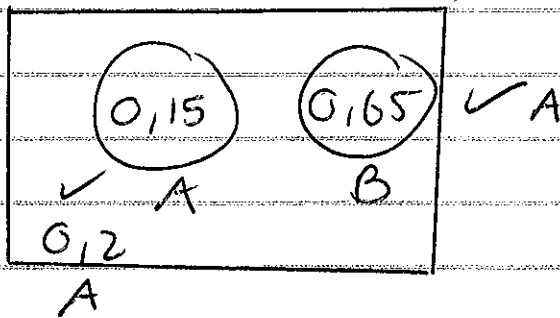
OR

$$B = 680000 \left(1 + \frac{9,25\%}{12}\right)^{85 \overset{\checkmark A}{}} - 6227,89 \left[ \frac{\left(1 + \frac{9,25\%}{12}\right)^{85} - 1}{\frac{9,25\%}{12}} \right] \checkmark M$$

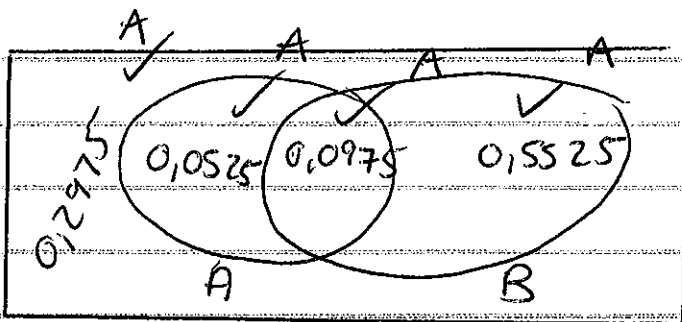
$$B = R562201,82 \quad \checkmark \quad A$$

# Question 11

(a) (1)



(2)  $P(A) \times P(B) = 0,15 \times 0,65$   
 $= 0,0975$   
 $= P(A \cap B)$



(b) (1)  $10^6 = 1000\ 000 \quad (A)(A)$

(2)  $10 \times 9 \times 8 \times 7 \times 6 \times 5 = 151\ 200$

(c) (1)  $\frac{11!}{2!2!2!} - 1 = 498\ 9600 - 1 = 4989599$

(2)  $\frac{8!}{2!2!} \times \frac{4!}{2!} = 4989600$

$= 2,42\% \text{ (or } 0,024)$