MULTIMEDIA **UNIVERSITY**

SECOND TRIMESTER, **2020/2021 SESSION**

TEST 1 (AFE)
MATHEMATICS I
(PMT0101)

11th March 2021
2.00 p.m. – 3.15 p.m.
(1 hour 15 minutes)

Name   :_____

ID   : _____

Question	Mark
1	**/4**
2	**/8**
3	**/8**
Total	**/20**

Score	
Format (PDF)	
Presentation (Neat)	
File Naming	
Late	
Total	

INSTRUCTIONS TO STUDENT
1) Show **intermediate** working steps in order to obtain maximum scores.
2) Working steps have to be **handwritten**, not typewritten.
3) Before submitting, make sure you go through your work to ensure it is **neat and legible**.
4) Make sure you write your full name and ID number on the first page of your script.
5) Name this file as follows: **<your ID no.>_Test 1 (AFE)**, for example 1234567890_Test 1 (AFE).
6) Submit via Google Classroom in **PDF** format.

Question 1

a) Rationalize the numerator for $\dfrac{\sqrt{2}-3}{\sqrt{2}+3}$. (2 marks)

$$\frac{\sqrt{2}-3}{\sqrt{2}+3}\left(\frac{\sqrt{2}+3}{\sqrt{2}+3}\right) \qquad \textbf{0.5m}$$

$$=\frac{2-9}{2+6\sqrt{2}+9} \qquad \textbf{0.5m+0.5m}$$

$$=-\frac{7}{11+6\sqrt{2}} \qquad \textbf{0.5m}$$

b) Simplify the expression $\dfrac{x^3+3x^2+4x+12}{x^2-9}$. (2 marks)

$$\frac{x^3+3x^2+4x+12}{x^2-9} \qquad \textbf{0.5m+0.5m}$$

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

$$=\frac{(x+3)\left(x^2+4\right)}{(x+3)(x-3)} \qquad \textbf{0.5m}$$

$$=\frac{x^2+4}{x-3} \qquad \textbf{0.5m}$$

Question 2

a) Find the value of q given the equation has one real solution.

$$x^2+4x+q=0 \qquad \text{(1 mark)}$$

$$b^2-4ac=0$$

$$4^2-4(1)q=0 \qquad \textbf{0.5m}$$

$$q=4 \qquad \textbf{0.5m}$$

b) Given the length and width of a rectangle are x and $\sqrt{2+x}$, respectively. Find the value(s) of x if the perimeter of the rectangle is 20 units². (3 marks)

$2x + 2\sqrt{2+x} = 20$ **0.5m**

$x + \sqrt{2+x} = 10$

$\left(\sqrt{2+x}\right)^2 = (10-x)^2$ **0.5m**

$2 + x = 100 - 20x + x^2$

$x^2 - 21x + 98 = 0$ **0.5m**

$(x-7)(x-14) = 0$

$x = 7$ or $x = 14$ **0.5m+0.5m**

Checking:

if $x = 7$ if $x = 14$

LHS: LHS:

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

$= 2(7) + 2\sqrt{2+7}$ $= 2(14) + 2\sqrt{2+14}$

$= 14 + 6$ $= 28 + 8$

$= 20$ $= 36$

LHS $=$ RHS   LHS $\neq$ RHS

$\therefore x = 7$ **0.5m**

c) Find the domain of $h(x) = \dfrac{x-1}{\sqrt{x^2 - x - 6}}$. Note: Show clearly your Sign Diagram and give your final answer in interval notation. (4 marks)

$x^2 - x - 6 > 0$ **0.5m**

$(x-3)(x+2) > 0$

Find zeros

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

$x = 3$ or $x = -2$ **0.5m+0.5m**

	-2		3	
Sign of $(x-3)$	-	-	+	**0.5m**
Sign of $(x+2)$	-	+	+	**0.5m**
Sign of $(x-3)(x+2)$	+	-	+	**0.5m**

The solution in interval notation: $(-\infty, -2) \cup (3, \infty)$ **0.5m+0.5m**

Question 3

a) Find an equation of the line that passes through the point $(0,3)$ and the centre of the circle, $3x^2 + 3y^2 + 6x - 12y - 9 = 0$. Express the line equation in the slope-intercept form.

(4.5 marks)

|	
$3x^2 + 3y^2 + 6x - 12y - 9 = 0$	
$x^2 + y^2 + 2x - 4y - 3 = 0$	**0.5m**
$x^2 + 2x + y^2 - 4y = 3$	
$x^2 + 2x + \left(\dfrac{2}{2}\right)^2 + y^2 - y + \left(-\dfrac{4}{2}\right)^2 = 3 + \left(\dfrac{2}{2}\right)^2 + \left(-\dfrac{4}{2}\right)^2$	**0.5m+0.5m**
$(x+1)^2 + (y-2)^2 = 8$	**0.5m+0.5m**
Center of the circle $= (-1,2)$	**0.5m**
Line equation $\dfrac{y-3}{x-0} = \dfrac{2-3}{-1-0}$	**0.5m+0.5m**
$\dfrac{y-3}{x} = 1$ $y = x+3$	**0.5m**

b) Two variables, x and y are related by an equation $y = ax^2 + \dfrac{b}{x}$ where a and b are constants. The figure below shows the linear line graph by plotting $Y = xy$ against $X = x^3$. The linear line passes through the points $(2,6)$ and $(7,1)$.
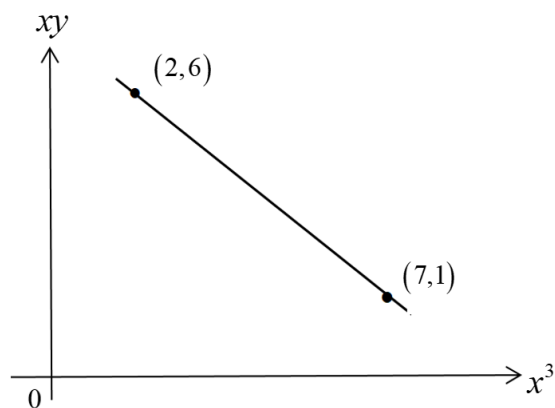
Find the values of a and b.   (3.5 marks)

$y = ax^2 + \dfrac{b}{x}$

$xy = ax^3 + b$

$Y = mX + c$

$m = \dfrac{6-1}{2-7}$ **0.5m+0.5m**

  $= -\dfrac{5}{5} = -1$ **0.5m**

Given $(2,6)$

$6 = -1(2) + c$ **0.5m**

$c = 8$ **0.5m**

$\therefore m = a = -1$ $c = b = 8$ **0.5m+0.5m**