

MULTIMEDIA



UNIVERSITY

SECOND TRIMESTER, 2020/2021 SESSION

TEST 2 (AFE)
MATHEMATICS I
(PMT0101)

4th March 2021
2.00 p.m. – 3.30 p.m.
(1 hour 30 minutes)

Name : _____

ID : _____

Group : _____

Question	Mark
1	/7
2	/13
3	/10
Total	/30

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 2 (AFE)**, for example 1234567890_Test 2 (AFE).
- 6) Submit via Google Classroom in **PDF** format.

Question 1

a) Find the domain for $f(x) = \frac{5}{x^2 - 16}$. Express your answer in interval notation form.

[2 marks]

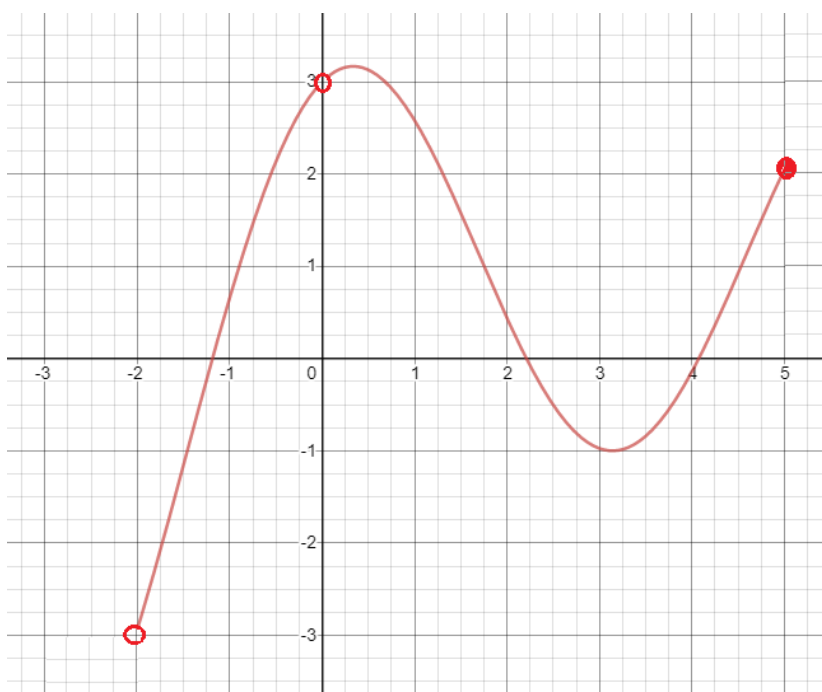
$$x^2 - 16 = 0$$

$$(x+4)(x-4) = 0$$

$$x = -4 \text{ or } x = 4 \quad \mathbf{0.5m}$$

$$\therefore D_f = (-\infty, -4) \cup (-4, 4) \cup (4, \infty) \quad \mathbf{0.5m+0.5m+0.5m}$$

b) The graph of a function h is given below.



i) Find $h(0)$.

[0.5 marks]

$$h(0) = \text{undefined} \quad \mathbf{0.5m}$$

ii) State the domain of h . Express your answer in interval notation form. [1 mark]

$$D_h = (-2, 0) \cup (0, 5] \quad \mathbf{0.5m+0.5m}$$

iii) Find the value of x for which $h(x) = -2$.

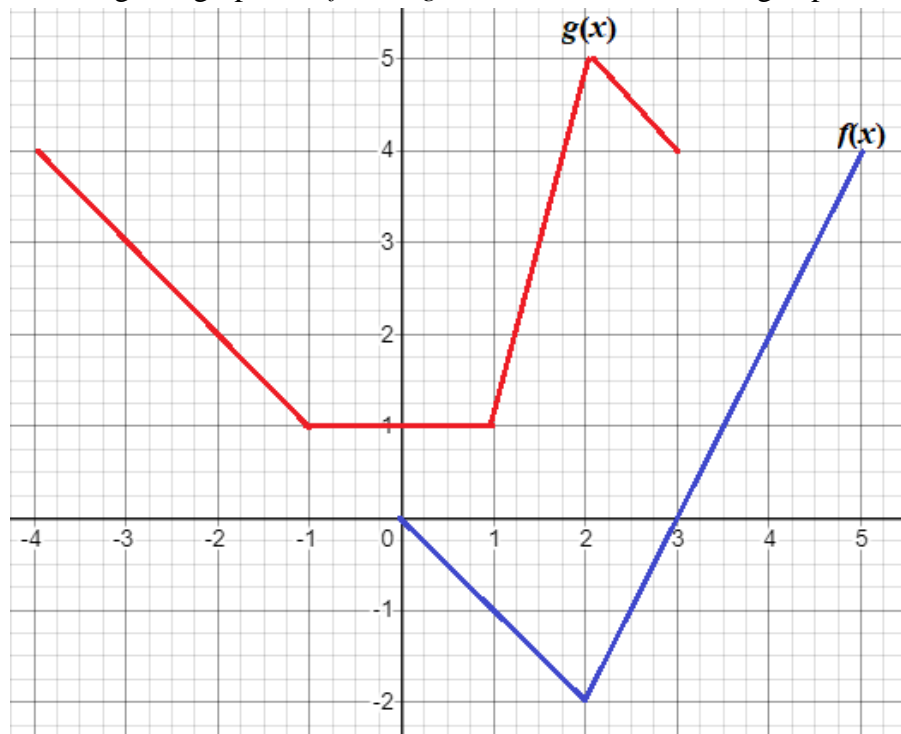
[0.5 marks]

$$h(x) = -2$$

0.5m

$$\therefore x = -1.75$$

c) Use the given graphs of f and g to evaluate the following expressions.



i) $(f \circ g)(-3)$

[1 mark]

$$(f \circ g)(-3) = f[g(-3)]$$

$$= f(3) \quad \text{0.5m}$$

$$= 0 \quad \text{0.5m}$$

ii) $(f + g)(2)$

[1 mark]

$$(f + g)(2) = f(2) + g(2)$$

$$= -2 + 5 \quad \text{0.5m}$$

$$= 3 \quad \text{0.5m}$$

iii) $(fg)(1)$

[1 mark]

$$(fg)(1) = f(1) \cdot g(1)$$

$$= (-1)(1) \quad \text{0.5m}$$

$$= -1 \quad \text{0.5m}$$

Question 2

a) Given the polynomial function $f(x) = x(x+2)(x+1)^2(x-1)^3$.

i) What is the degree of f ?

[0.5 marks]

Degree = 7

0.5m

ii) Determine the zeros of f and their multiplicities. Also, determine whether the graph of f crosses or touches the x -axis at each zero. [4 marks]

The zeros of f , let $f(x) = 0$.

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

$$x = 0 \text{ or } (x+2) = 0 \text{ or } (x+1)^2 = 0 \text{ or } (x-1)^3 = 0$$

$$x = 0 \text{ or } x = -2 \text{ or } x = -1 \text{ or } x = 1$$

Zeros	Multiplicities	Crosses/Touches x -axis
-2	1	Crosses
-1	2	Touches
0	1	Crosses
1	3	Crosses

1m

1m

1m

1m

1m (correct zero 0.5m; correct multiplicity and shape 0.5m)

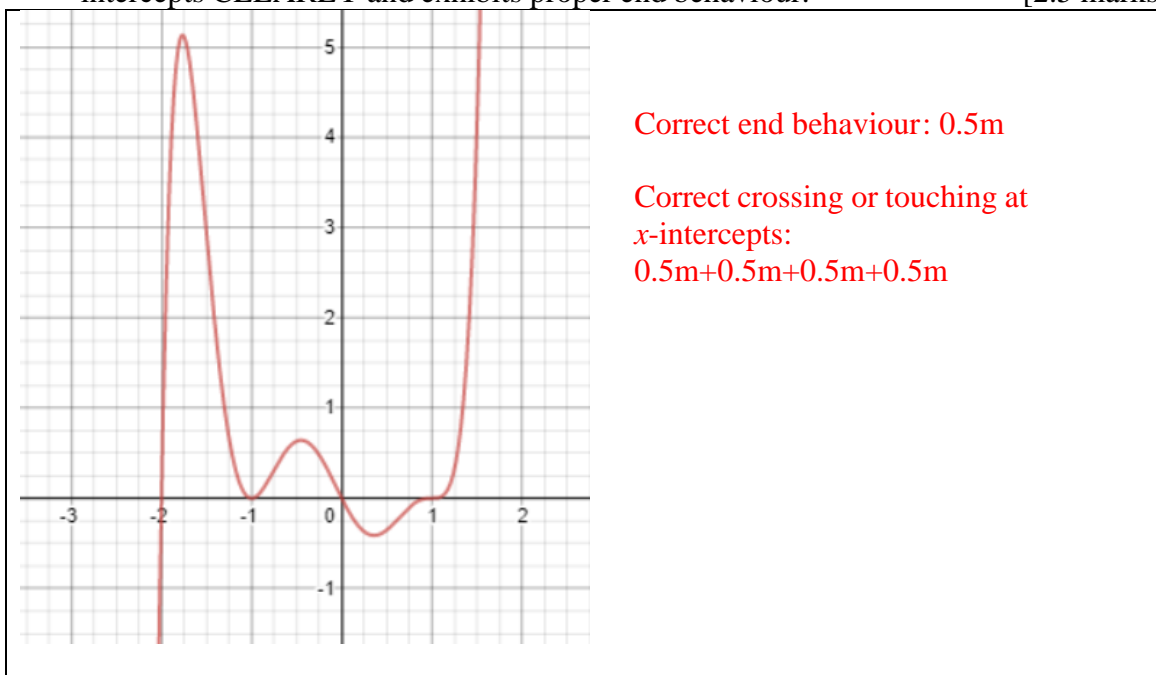
iii) Determine the end behavior of f .

[1 mark]

As $x \rightarrow \infty$, $y \rightarrow \infty$ **0.5m**

As $x \rightarrow -\infty$, $y \rightarrow -\infty$ **0.5m**

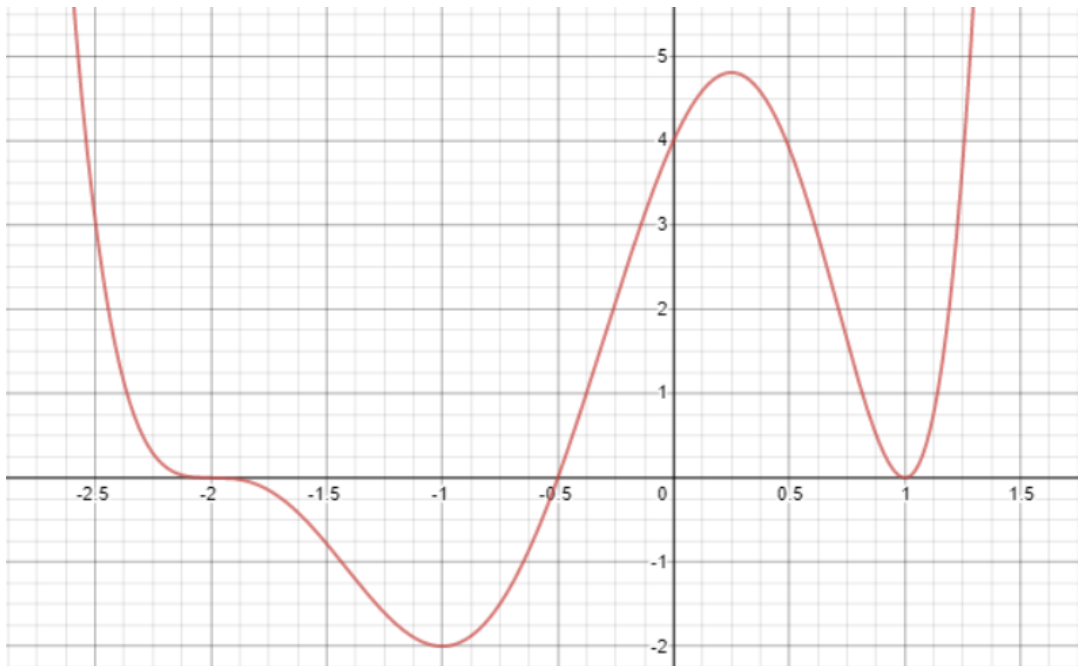
- iv) Sketch the graph of the polynomial f function. Make sure your graph shows all intercepts CLEARLY and exhibits proper end behaviour. [2.5 marks]



- b) Use long division to find the quotient and remainder when the polynomial $f(x) = 2x^4 - 3x^2 - x + 5$ is divided by $x - 1$. You are required to state clearly the quotient and the remainder. [3 marks]

$2x^3 + 2x^2 - x - 2$	0.5m
$x-1 \overline{) 2x^4 + 0x^3 - 3x^2 - x + 5}$	
$\underline{2x^4 - 2x^3}$	0.5m
$2x^3 - 3x^2$	
$\underline{2x^3 - 2x^2}$	0.5m
$-x^2 - x$	
$\underline{-x^2 + x}$	0.5m
$-2x + 5$	
$\underline{-2x + 2}$	0.5m
3	0.5m
Quotient = $2x^3 + 2x^2 - x - 2$	
Remainder = 3	

- c) Find the polynomial function for the graph below with the specified degree of 6.
[2 marks]



$$\text{Zeros} = -2, -\frac{1}{2}, 1$$

$$f(x) = a \left(x + \frac{1}{2} \right) (x-1)^2 (x+2)^3$$

0.5m+0.5m+0.5m+0.5m

if $x = 0$, y -intercept = 4

$$4 = a \left(0 + \frac{1}{2} \right) (0-1)^2 (0+2)^3$$

$$4 = 4a$$

$$a = 1$$

$$\therefore f(x) = \left(x + \frac{1}{2} \right) (x-1)^2 (x+2)^3$$

Question 3

a) Solve $\ln(x-1) + 2\ln 2 = 1$. Leave your answer in a single quotient. [2.5 marks]

$$\ln(x-1) + 2\ln 2 = 1$$

$$\ln(x-1)(2^2) = 1 \quad \text{0.5m}$$

$$(x-1)(2^2) = e \quad \text{0.5m}$$

$$4(x-1) = e \quad \text{0.5m}$$

$$x-1 = \frac{e}{4} \quad \text{0.5m}$$

$$x = \frac{e}{4} + 1 \quad \text{0.5m}$$

$$x = \frac{e+4}{4} \quad \text{0.5m}$$

b) Solve the equation $3e^{5-3x} = 18$. Leave your answer in exact value. [2 marks]

$$3e^{5-3x} = 18$$

$$e^{5-3x} = 6 \quad \text{0.5m}$$

$$\ln e^{5-3x} = \ln 6 \quad \text{0.5m}$$

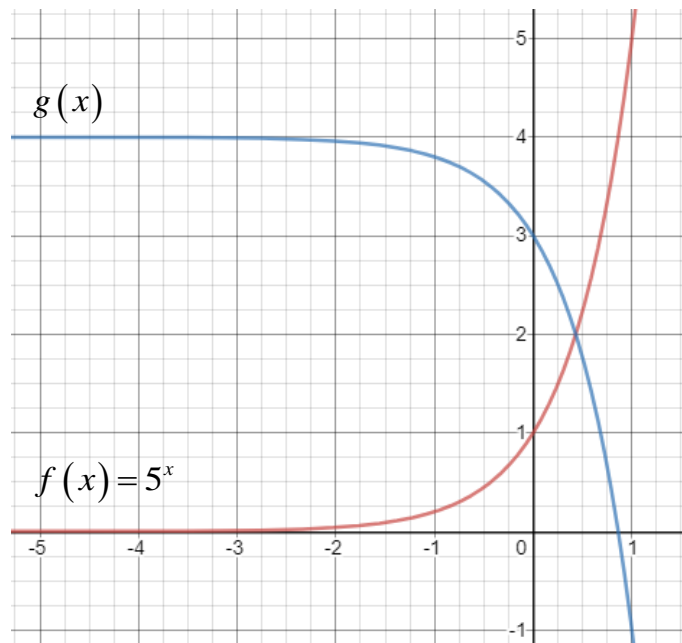
$$(5-3x)\ln e = \ln 6$$

$$5-3x = \ln 6 \quad \text{0.5m}$$

$$x = \frac{5-\ln 6}{3} \quad \text{0.5m}$$

c) The graphs f and g are given. Find a formula for the function g for each of the graph below.

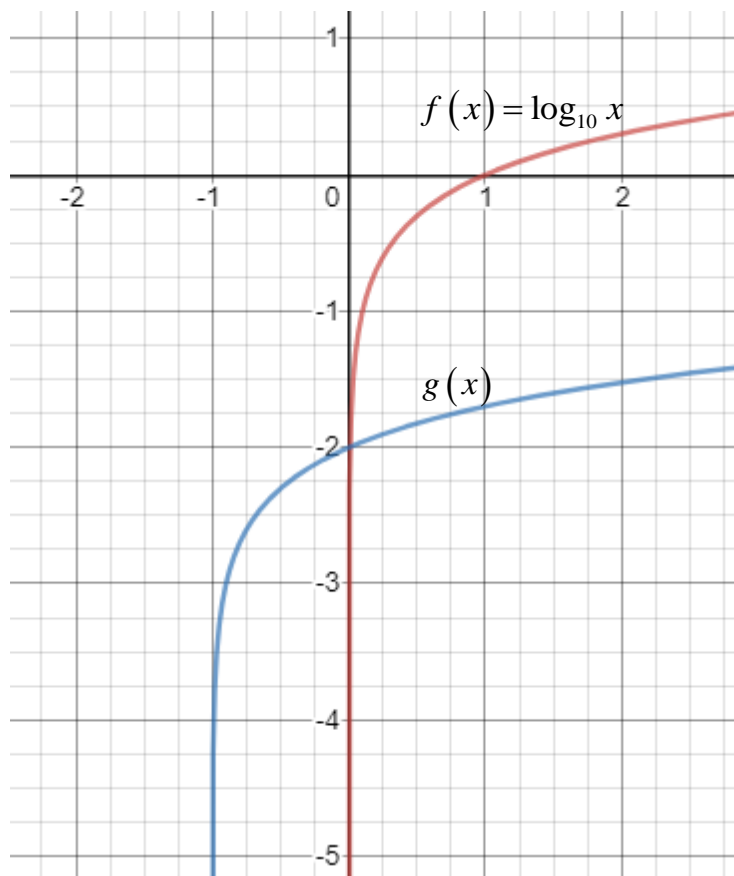
i)



[2 marks]

$g(x) = -5^x + 4$	1m+1m
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ii)



[2 marks]

$g(x) = \log_{10}(x+1) - 2$	1m+1m
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d) Without calculator, evaluate $\log_9 \sqrt{3}$.

[1.5 marks]

$\log_9 \sqrt{3} = \log_9 \sqrt{9^{\frac{1}{2}}}$	0.5m
$= \log_9 9^{\frac{1}{4}}$	0.5m
$= \frac{1}{4}$	0.5m