

## **Mathematical Methods Unit 1 Practice Examinations**

- Paper 1 – Technology Free  
(60 minutes + 15 minutes reading time)
- Paper 2 – Technology Active + Summary book  
(90 minutes + 15 minutes reading time)

*\*Solutions will be on the Methods revision page on STL link\**

**SECTION A**            **Technology- free [60 marks]**

**Question 1 [10 marks]**

Consider the equations  $f(x) = x^2 + 2x - 8$  and  $g(x) = -4x - 17$ .

- a)     Use the discriminant to find the number of points of intersection the two equations have.

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- b)     Find the coordinates of the point(s) of intersection of the two equations.

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- c)     Find the solution of  $f(x) < 7$

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- d)     Find the inverse equation of  $g(x)$ .

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[2+2+4+2=10 marks]



**Question 3 [7 marks]**

Consider the hybrid function  $f(x) = \begin{cases} x^2 - 2x, & -2 < x < 2 \\ 4 - x, & x \geq 2 \end{cases}$ .

a) Evaluate the following:

i)  $f(2)$

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ii)  $f(1)$

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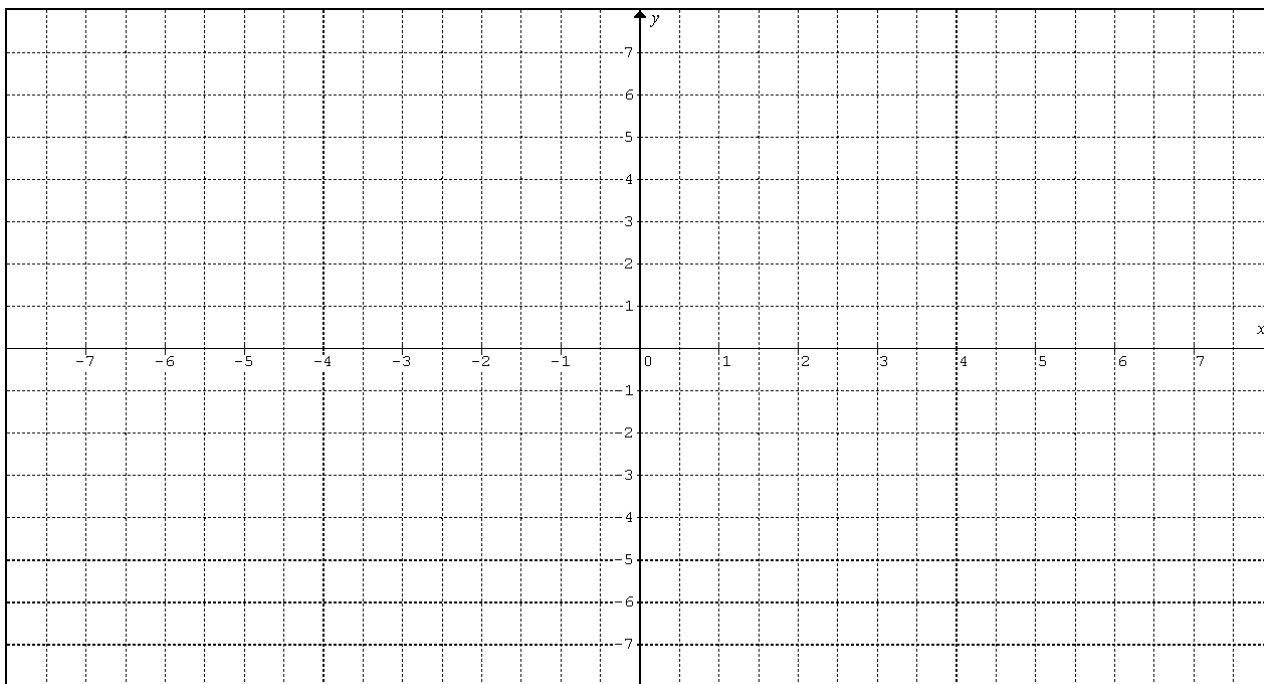
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iii)  $f(-2)$

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b) Sketch  $f(x)$  on the grid below.



[4+3=7 marks]

**Question 4 [3 marks]**

The point (2, -3) is reflected in the y axis followed by a dilation by a factor of 3 from the x axis. Use matrices to find the coordinates of the image (The transformed point).

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[3 marks]

**Question 5 [3 marks]**

For what value(s) of  $k$  does the equation  $2x^2 - kx + 8 = 0$  have no solutions?

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[3 marks]

**Question 6 [1 mark]**

State the implied domain of  $f(x) = \frac{2}{\sqrt{5-2x}}$

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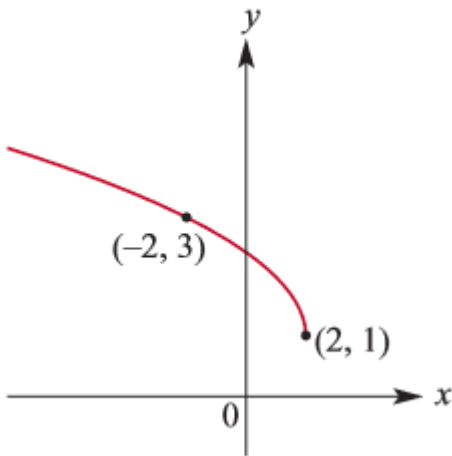
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[1 mark]

**Question 7 [5 marks]**

a) The graph of the function  $y = \sqrt{-x-b} + c$  is shown below.



Find the values of  $b$  and  $c$ .

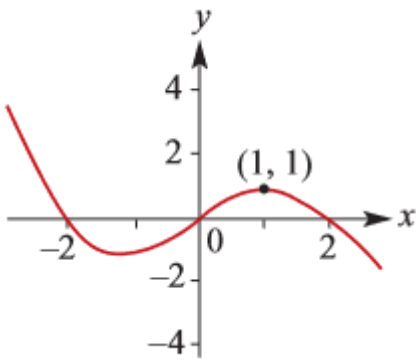
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b) The graph of a cubic function  $g(x)$  is shown below.



Find the equation of this function.

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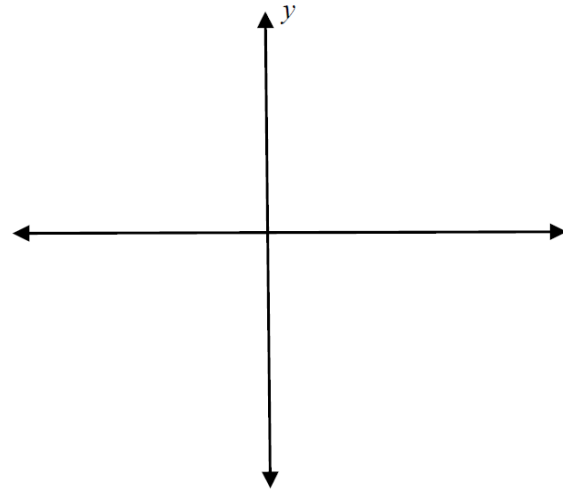
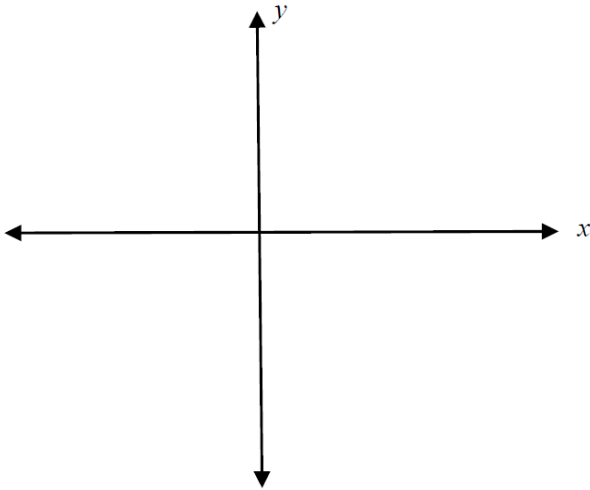
[2 + 3 = 5 marks]

**Question 8 [8 marks]**

Sketch each of the following graphs showing all the key points as coordinates and labelling any asymptotes with their equations.

a)  $f(x) = (x-2)^3 + 1$  for  $x \in (-1, 3]$

b)  $g(x) = \frac{2}{2-x} - 1$



Domain: \_\_\_\_\_

Range: \_\_\_\_\_

Domain: \_\_\_\_\_

Range: \_\_\_\_\_

[4+4=8 marks]

**Question 9 [6 marks]**

The graph  $y = x^2$  has been dilated by a factor of  $-2$  from the  $x$  axis and translated 4 units in the positive direction of the  $x$ -axis and 2 units in the negative direction of the  $y$ -axis.

a) What is the equation of the transformed graph?

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b) What are the coordinates of the vertex?

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c) The transformed graph is now translated so that the vertex is at (1, 2). Describe these translations.

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[3 + 1 + 2 = 6 marks]

**Question 10 [6 marks]**

a) Let  $f(x) = (x^2 - 1)\left(\frac{1}{x} + 3\right)$ . Find  $f'(x)$  and  $f'(1)$

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b) Find  $f(x)$  if  $f'(x) = 2x^2 - 3x + 2$  and  $f(1) = 0$ .

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[3+3 = 6 marks]

**Question 11 [4 marks]**

Consider the relation  $x^2 + y^2 + 6x - 10y = 0$ .

a) Show that the centre of the circle is  $(-3, 5)$ .

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b) Find the **exact** length of the diameter of the circle.

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[3+1=4 marks]

**END OF SECTION PAPER 1**