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.

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

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

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

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

Question 2 [8 marks]

a) Fully factorise the following polynomial expression $P(t) = t^3 - 64t$

b) Fully factorise $P(x) = 2x^3 + 5x^2 - x - 6$ by first showing that $(x+2)$ is a factor of the polynomial.

c) Solve $2t^2 - 11t = 6$ for t.

[2+4+2 = 8 marks]

Question 3 [7 marks]

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

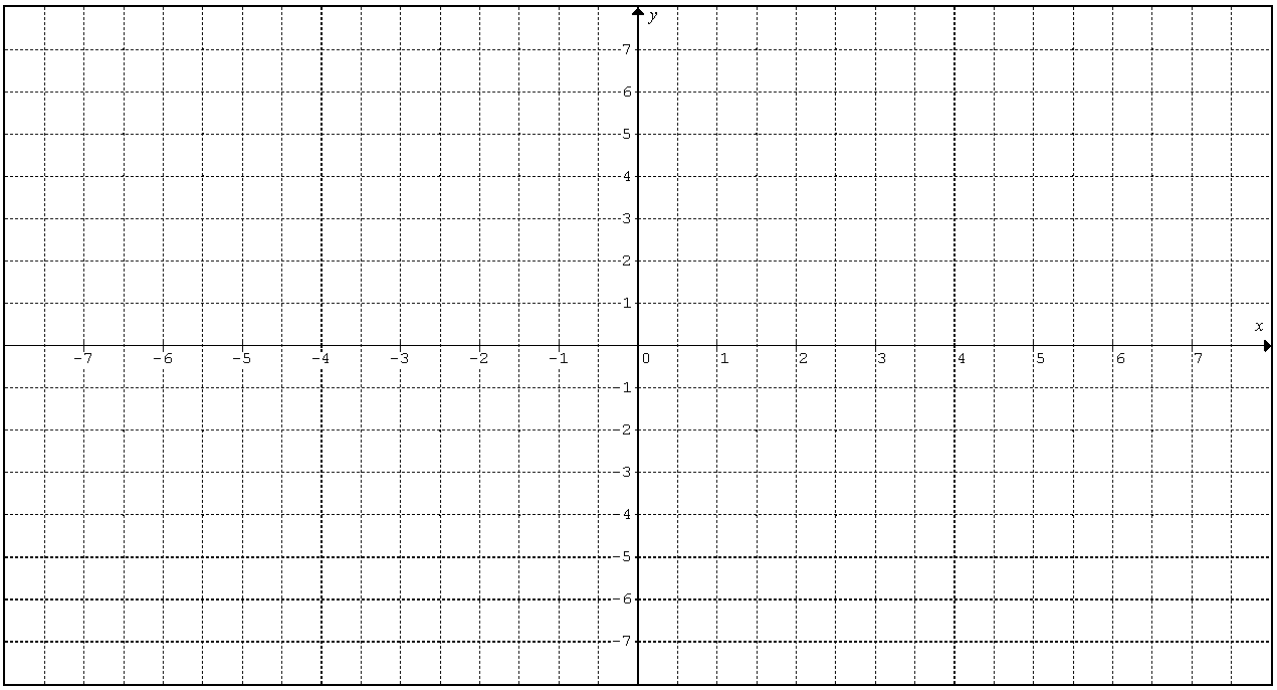
a) Evaluate the following:

i) $f(2)$

ii) $f(1)$

iii) $f(-2)$

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).

[3 marks]

Question 5 [3 marks]

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

[3 marks]

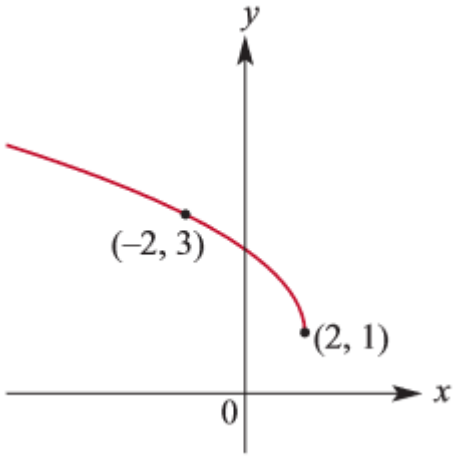
Question 6 [1 mark]

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

[1 mark]

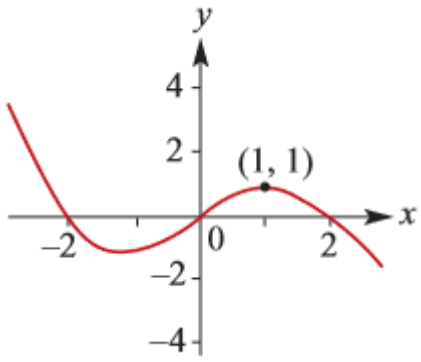
Question 7 [5 marks]

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



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

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

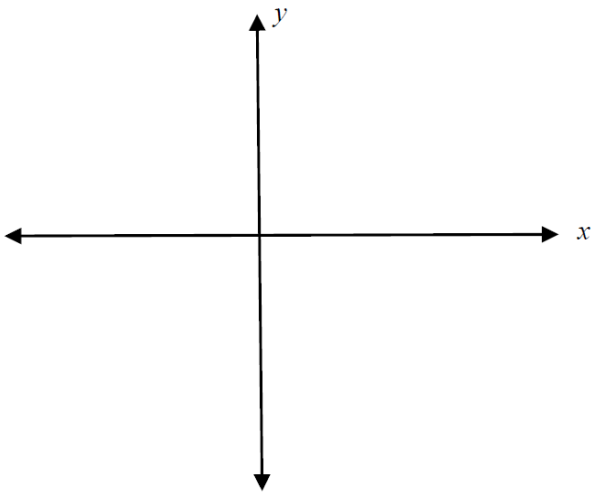


Find the equation of this function.

[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.

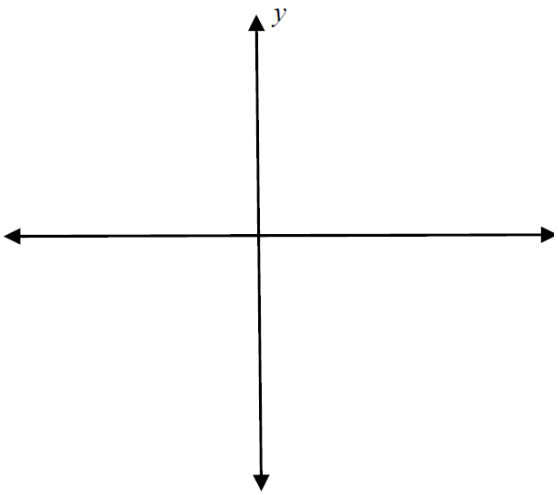
a) $f(x)=(x-2)^3+1 \text{ for } x\in(-1,3]$



Domain: _____

Range: _____

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



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?

_____

_____

b) What are the coordinates of the vertex?

_____

_____

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

[3 + 1 + 2 = 6 marks]

Question 10 [6 marks]

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

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

[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 $(-3, 5)$.

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

[3+1=4 marks]

END OF SECTION PAPER 1