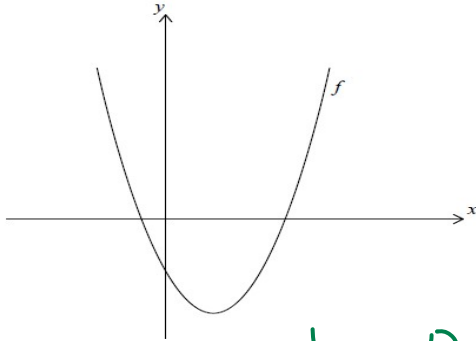


Notes Week 3

1a. [5 marks]

Let $f(x) = x^2 - 4x - 5$. The following diagram shows part of the graph of f .



→ set $y=0$ and factor

Find the x -intercepts of the graph of f .

$$0 = (x-5)(x+1) \quad x = -1, 5$$

1b. [2 marks]

Find the equation of the axis of symmetry of the graph of f .

$$x = \frac{-(-4)}{2(1)} = \frac{4}{2} = 2$$

1c. [1 mark]

The function can be written in the form $f(x) = (x-h)^2 + k$.

vertex form
vertex: (h, k)

Write down the value of h .

$$h = 2$$

1d. [3 marks]

Find the value of k .

$$k = (2-5)(2+1) = (-3)(3) = -9$$

1e. [5 marks]

The graph of a second function, g , is obtained by a reflection of the graph of f in the y -axis, followed by a translation of $\begin{pmatrix} -3 \\ 6 \end{pmatrix}$. \rightarrow Left + 3
 \rightarrow up 6

Find the coordinates of the vertex of the graph of g .

1st trans $y = (x+2)^2 - 9$
2nd trans $y = (x+5)^2 - 3$
Vertex of g $(-5, -3)$

2a. [2 marks]

rational function

Let $f(x) = \frac{6x-1}{2x+3}$, for $x \neq -\frac{3}{2}$.

For the graph of f , find the y -intercept.

\rightarrow Plug in 0 for x

$-\frac{1}{3}$

2b. [1 mark]

For the graph of f , find the equation of the vertical asymptote.

$x = -\frac{3}{2}$

2c. [2 marks]

For the graph of f , find the equation of the horizontal asymptote.

$y = \frac{6}{2} = 3$

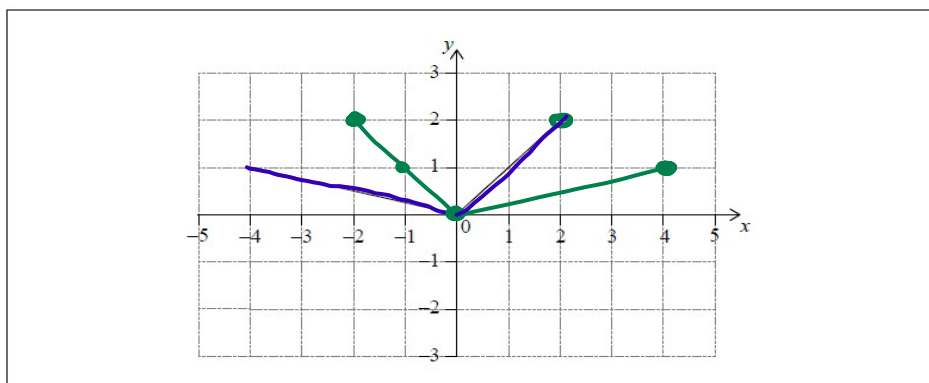
2d. [2 marks]

Hence or otherwise, write down $\lim_{x \rightarrow \infty} \left(\frac{6x-1}{2x+3} \right)$.

$\lim_{x \rightarrow \infty} \left(\frac{6x-1}{2x+3} \right) = 3 \rightarrow$ Horizontal asymptote

3a. [2 marks]

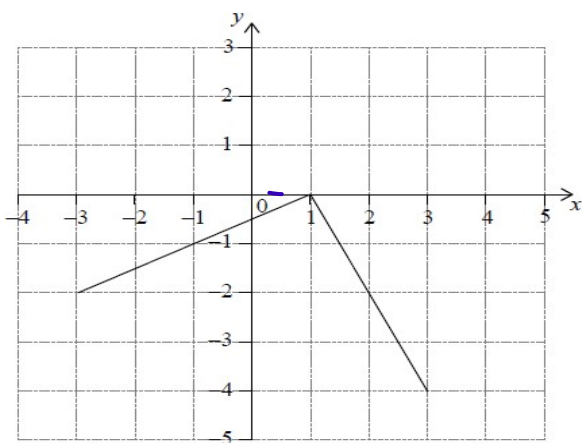
The following diagram shows the graph of a function f , for $-4 \leq x \leq 2$.



On the same axes, sketch the graph of $f(-x)$.

3b. [4 marks]

Another function, g , can be written in the form $g(x) = a \times f(x + b)$. The following diagram is the graph of g .

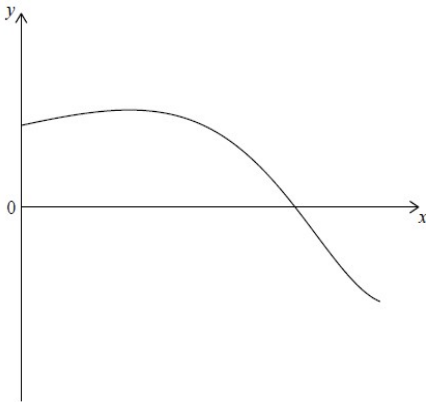


Write down the value of a and of b .

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

4a. [2 marks]

Let $f(x) = \sin(e^x)$ for $0 \leq x \leq 1.5$. The following diagram shows the graph of f .



θ	$\sin \theta$
0	0
$\pi/2$	1
π	0
$3\pi/2$	-1
2π	0

Find the x-intercept of the graph of f .

$$0 = \sin(e^x) \quad \pi = e^x \quad \text{In calc } x = \ln \pi$$

4b. [3 marks]

The region enclosed by the graph of f , the y-axis and the x-axis is rotated 360° about the x-axis.

Find the volume of the solid formed. Volume is volume of cylinder $\text{Area} = \pi r^2 h$

$$\text{Volume} = \int \text{area}$$

$$\text{Volume} = \pi \int_0^{\ln \pi} (\sin(e^x))^2 dx = 250$$

5a. [2 marks]

Let $f(x) = \frac{8x-5}{cx+6}$ for $x \neq -\frac{6}{c}$, $c \neq 0$.

The line $x = 3$ is a vertical asymptote to the graph of f . Find the value of c .

$$cx+6=0 \quad 3c+6=0 \quad 3c=-6 \quad c=-2$$

5b. [2 marks]

Write down the equation of the horizontal asymptote to the graph of f .

$$y = \frac{8}{-2} = -4$$

5c. [3 marks]

The line $y = k$, where $k \in \mathbb{R}$ intersects the graph of $|f(x)|$ at exactly one point. Find the possible values of k .

↗ real #'s
↓ is an element of

$k = 0, 4$

6a. [2 marks]

Let $f(x) = \frac{6x^2 - 4}{e^x}$, for $0 \leq x \leq 7$.

Find the x -intercept of the graph of f .

$$x^2 = \frac{2}{3}$$

$$x = \sqrt{\frac{2}{3}}$$

$0 = \frac{6x^2 - 4}{e^x}$ $6x^2 - 4 = 0$
 $6x^2 = 4$
 $x^2 = \frac{4}{6}$ $x = \sqrt{\frac{2}{3}}$

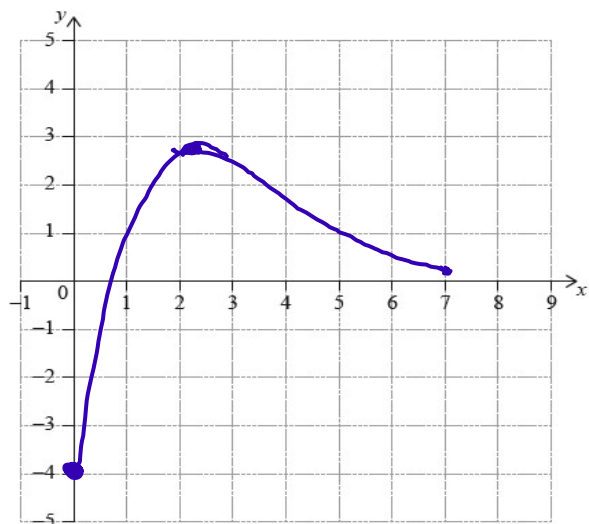
6b. [2 marks]

The graph of f has a maximum at the point A. Write down the coordinates of A.

A. (2.29, 2.78)

6c. [3 marks]

On the following grid, sketch the graph of f .



$$f(x) = \frac{6x^2 - 4}{e^x}$$

$$f(0) = -4$$

$$f(7) \approx 264$$

7a. [3 marks]

Let $f(x) = 3 \sin\left(\frac{\pi}{2}x\right)$, for $0 \leq x \leq 4$.

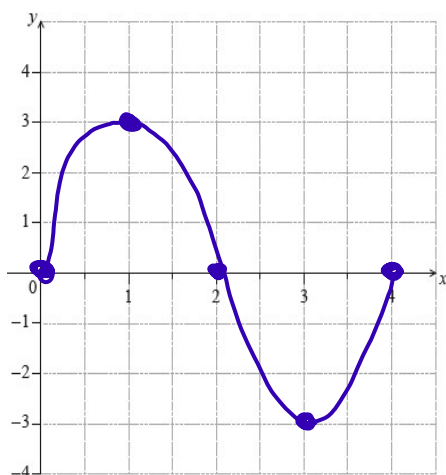
- (i) Write down the amplitude of f .
- (ii) Find the period of f .

(i) 3

(ii) $\frac{2\pi}{\pi/2} = 4$

7b. [4 marks]

On the following grid sketch the graph of f .



SIN \rightarrow MID
max
MID
min
MID

count by
 $\frac{P}{4} = \frac{4}{4} = 1$

8a. [2 marks]

The following diagram shows part of the graph of a quadratic function f .

The vertex is at $(3, -1)$ and the x -intercepts at 2 and 4.

The function f can be written in the form $f(x) = (x - h)^2 + k$.

Write down the value of h and of k .

