

# TEST 1

Functions and graphs  
Technology-free end-of-year examination  
Total marks: 25  
Suggested writing time: 40 minutes

## Specific instructions to students

- Answer all of the questions in the spaces provided.
- Show all workings in questions where more than one mark is available.
- An exact value must be provided in questions where a numerical answer is required, unless otherwise specified.

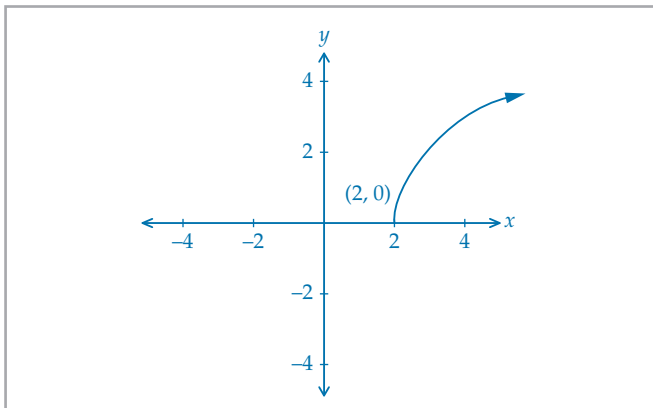
### QUESTION 1

- a State the maximal domain for the function  $y = 2\sqrt{x-2}$ .

$$x \in [2, \infty)$$

1 mark

- b Hence sketch the graph of  $y = 2\sqrt{x-2}$ , labelling any axial intercepts with their coordinates.

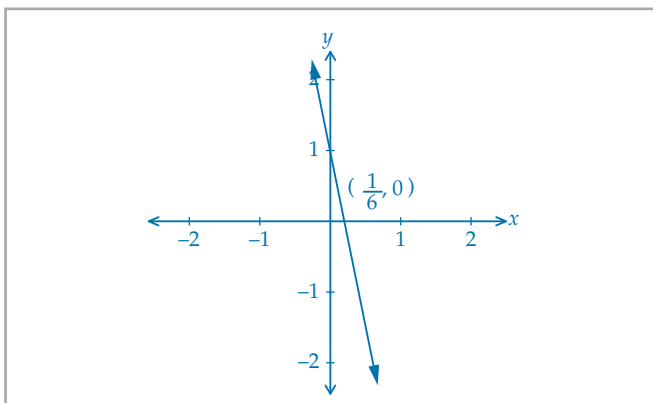


2 marks

(Total: 3 marks)

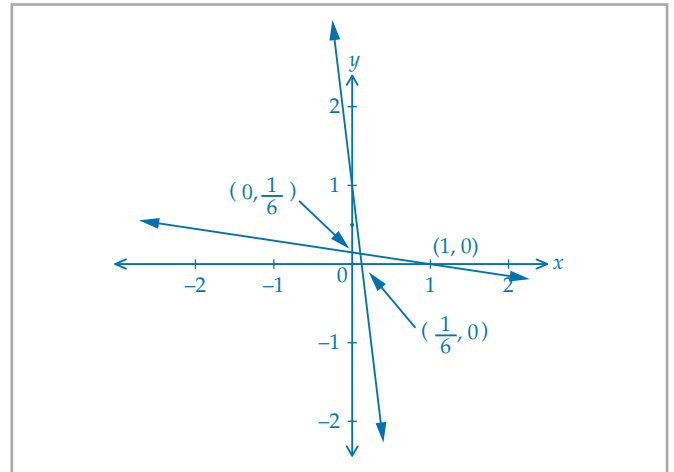
### QUESTION 2

- a Sketch the graph of  $f(x) = 1 - 6x$ , labelling all axial intercepts.



2 marks

- b On the same set of axes, sketch the graph of the inverse function  $f^{-1}$ , labelling all axial intercepts clearly.

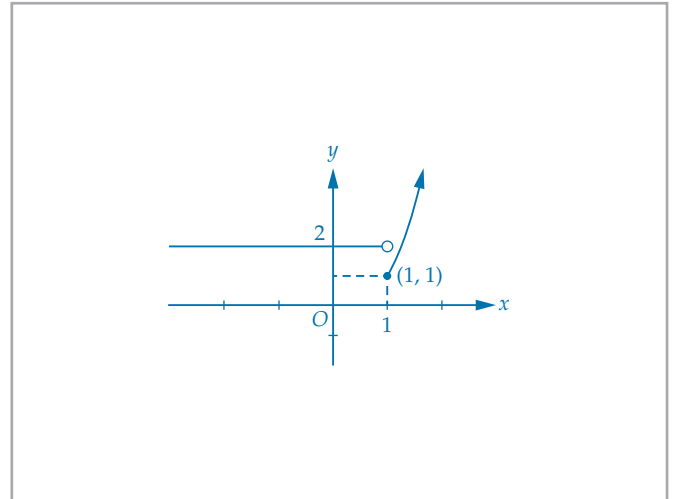


2 marks

(Total: 4 marks)

### QUESTION 3

- a Sketch the graph of  $y = \begin{cases} x^3, & x \geq 1 \\ 2, & x < 1 \end{cases}$



2 marks

- b State the value of  $f(2)$ .

$$f(2) = 8$$

1 mark

(Total: 3 marks)

#### QUESTION 4

- a State the domain and range of the function

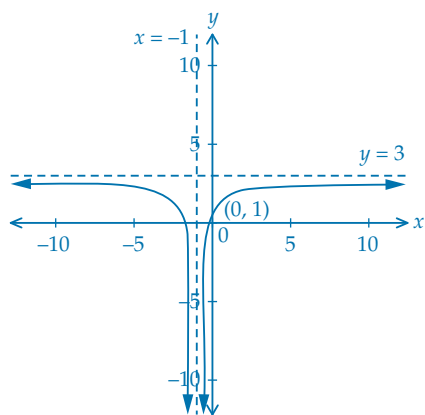
$$y = -\frac{2}{(x+1)^2} + 3.$$

Domain:  $x \in \mathbb{R} \setminus \{-1\}$

Range:  $y \in (-\infty, 3)$

2 marks

- b Hence sketch the graph of function  $y = -\frac{2}{(x+1)^2} + 3$ , labelling equations of asymptotes and any  $y$ -intercepts with their coordinates.

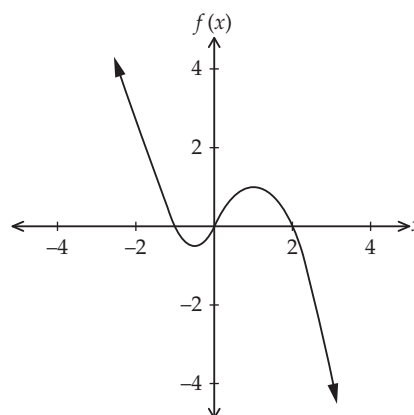


2 marks

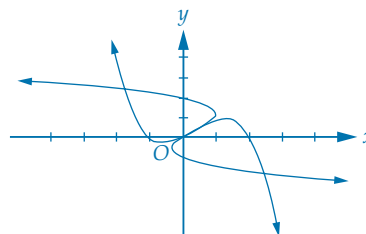
(Total: 4 marks)

#### QUESTION 5

A cubic function is shown below.



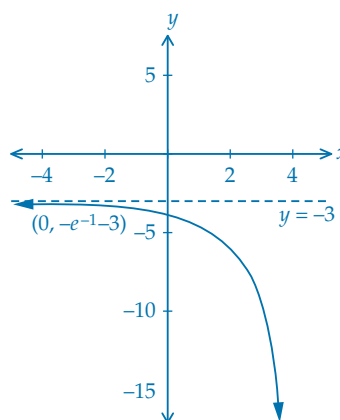
Sketch the inverse relation on the same set of axes.



2 marks

#### QUESTION 6

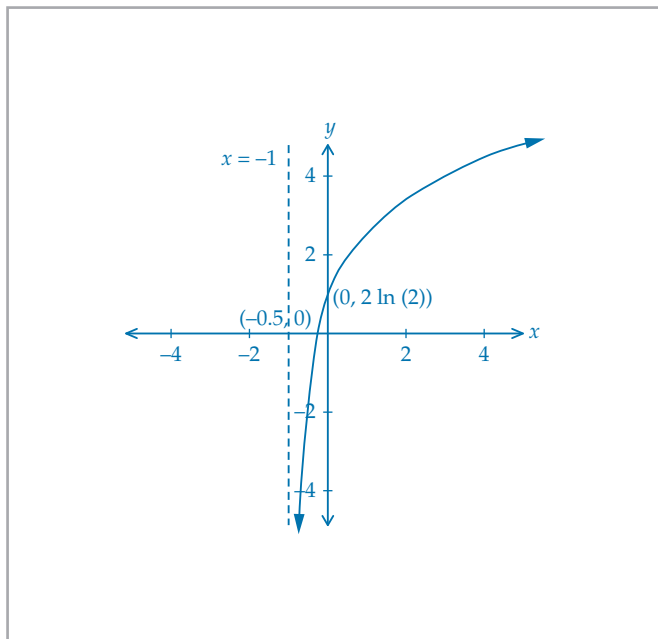
Sketch the graph of  $y = -e^{x-1} - 3$ , labelling intercepts with the axes and giving the equations of any asymptotes.



2 marks

### QUESTION 7

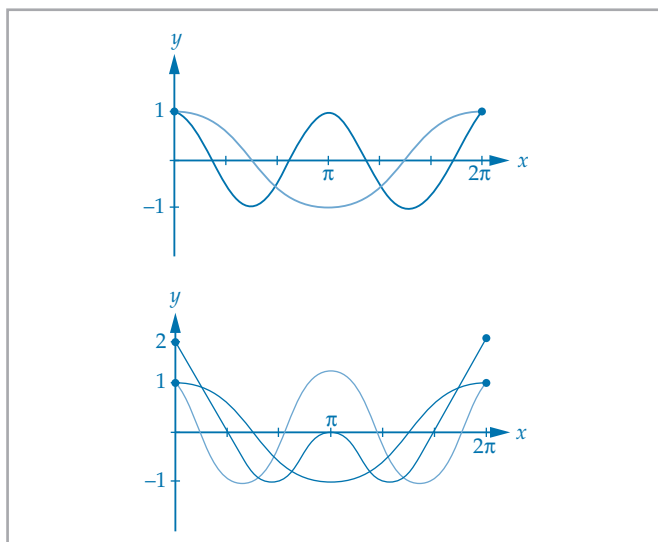
Sketch the graph of  $y = 2 \log_e (2x + 2)$ , labelling intercepts with the axes and giving the equations of any asymptotes.



2 marks

### QUESTION 8

Sketch  $y = \cos(x)$  and  $y = \cos(2x)$  on the same set of axes for  $0 \leq x \leq 2\pi$ . Hence, using addition of ordinates, sketch the graph of  $y = \cos(x) + \cos(2x)$ .



3 marks

### QUESTION 9

The coordinates of  $A$  and  $B$  are  $(-3, 1)$  and  $(2, -3)$  respectively. Find the equation of the line that passes through the points  $A$  and  $B$ .

Use the equation of the line  $y - y_1 = m(x - x_1)$

$$\text{Gradient of the line} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3 - 1}{2 + 3} = -\frac{4}{5}$$

Using  $(-3, 1)$ ,  $y - y_1 = m(x - x_1)$  gives

$$y - 1 = -\frac{4}{5}(x + 3)$$

$$y = -\frac{4}{5}x - \frac{7}{5}$$

2 marks