

# Transformations of graphs

## Difficulty : Medium

### Question Paper 1

Level	AS & A Level
Subject	Maths - Pure
Exam Board	Edexcel
Topic	Graphs and transformations
Sub-Topic	Transformations of graphs
Difficulty	Medium
Booklet	Question Paper 1

**Time allowed:** 42 minutes

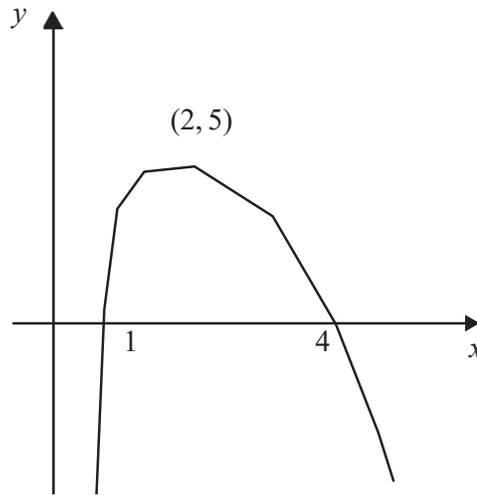
**Score:** /35

**Percentage:** /100

#### Grade Boundaries:

A*	A	B	C	D	E	U
>76%	61%	52%	42%	33%	23%	<23%

## Question 1



**Figure 1**

Figure 1 shows a sketch of the curve with equation  $y = f(x)$ . The curve crosses the  $x$ -axis at the points  $(1, 0)$  and  $(4, 0)$ . The maximum point on the curve is  $(2, 5)$ .

In separate diagrams sketch the curves with the following equations.

On each diagram show clearly the coordinates of the maximum point and of each point at which the curve crosses the  $x$ -axis.

(a)  $y = 2f(x)$ , **(3)**

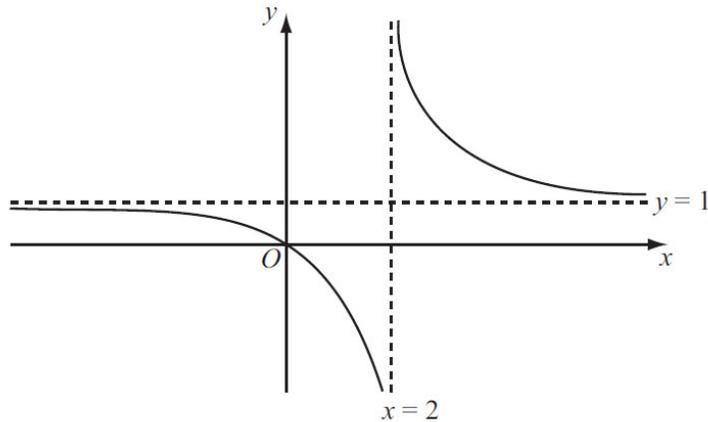
(b)  $y = f(-x)$ . **(3)**

The maximum point on the curve with equation  $y = f(x + a)$  is on the  $y$ -axis.

(c) Write down the value of the constant  $a$ . **(1)**

**(Total 7 marks)**

## Question 2



**Figure 1**

Figure 1 shows a sketch of the curve with equation  $y = f(x)$  where

$$f(x) = \frac{x}{x-2}, \quad x \neq 2$$

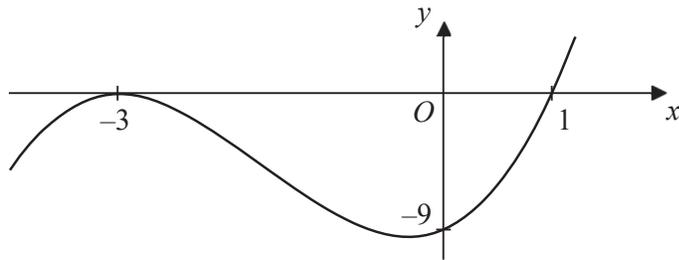
The curve passes through the origin and has two asymptotes, with equations  $y = 1$  and  $x = 2$ , as shown in Figure 1.

(a) In the space below, sketch the curve with equation  $y = f(x - 1)$  and state the equations of the asymptotes of this curve. (3)

(b) Find the coordinates of the points where the curve with equation  $y = f(x - 1)$  crosses the coordinate axes. (4)

**(Total 7 marks)**

### Question 3



**Figure 1**

Figure 1 shows a sketch of the curve with equation  $y = f(x)$  where

$$f(x) = (x + 3)^2 (x - 1), \quad x \in \mathbb{R}.$$

The curve crosses the  $x$ -axis at  $(1, 0)$ , touches it at  $(-3, 0)$  and crosses the  $y$ -axis at  $(0, -9)$

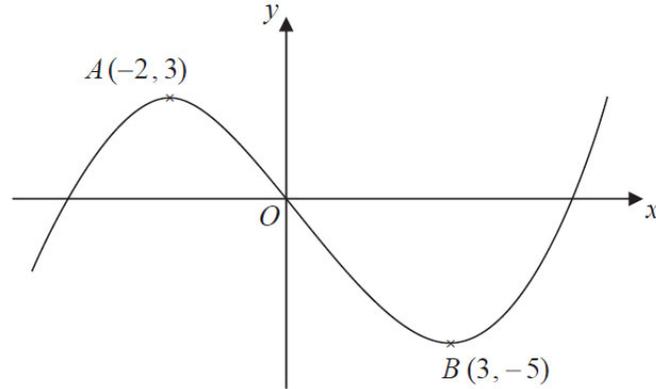
(a) In the space below, sketch the curve  $C$  with equation  $y = f(x + 2)$  and state the coordinates of the points where the curve  $C$  meets the  $x$ -axis. (3)

(b) Write down an equation of the curve  $C$ . (1)

(c) Use your answer to part (b) to find the coordinates of the point where the curve  $C$  meets the  $y$ -axis. (2)

**(Total 6 marks)**

## Question 4



**Figure 1**

Figure 1 shows a sketch of the curve with equation  $y = f(x)$ . The curve has a maximum point  $A$  at  $(-2, 3)$  and a minimum point  $B$  at  $(3, -5)$ .

On separate diagrams sketch the curve with equation

(a)  $y = f(x+3)$  **(3)**

(b)  $y = 2f(x)$  **(3)**

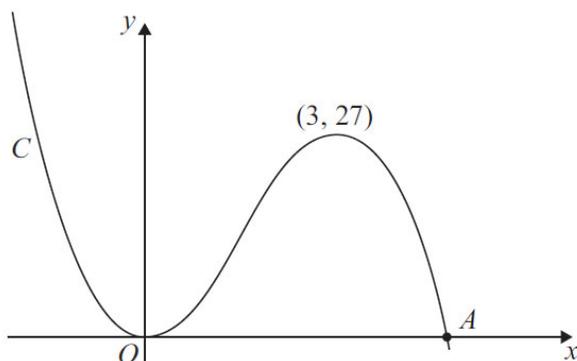
On each diagram show clearly the coordinates of the maximum and minimum points.

The graph of  $y = f(x) + a$  has a minimum at  $(3, 0)$ , where  $a$  is a constant.

(c) Write down the value of  $a$ . **(1)**

**(Total 7 marks)**

## Question 5



**Figure 1**

Figure 1 shows a sketch of the curve  $C$  with equation  $y = f(x)$  where

$$f(x) = x^2(9 - 2x)$$

There is a minimum at the origin, a maximum at the point  $(3, 27)$  and  $C$  cuts the  $x$ -axis at the point  $A$ .

(a) Write down the coordinates of the point  $A$ . **(1)**

(b) On separate diagrams sketch the curve with equation

(i)  $y = f(x + 3)$

(i)  $y = f(3x)$

On each sketch you should indicate clearly the coordinates of the maximum point and any points where the curves cross or meet the coordinate axes. **(6)**

The curve with equation  $y = f(x) + k$ , where  $k$  is a constant, has a maximum point at  $(3, 10)$ .

(c) Write down the value of  $k$ . **(1)**

**(Total 8 marks)**