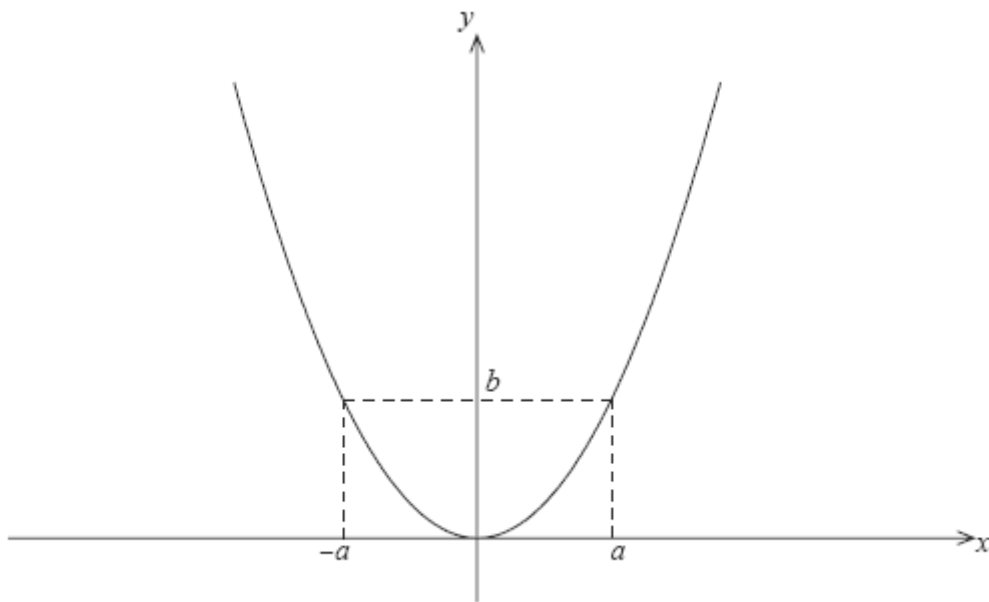


1. (a) Express the quadratic  $3x^2 - 6x + 5$  in the form  $a(x + b)^2 + c$ , where  $a, b, c \in \mathbb{Z}$ . (3)

(b) Describe a sequence of transformations that transforms the graph of  $y = x^2$  to the graph of  $y = 3x^2 - 6x + 5$ .

(3)  
(Total 6 marks)

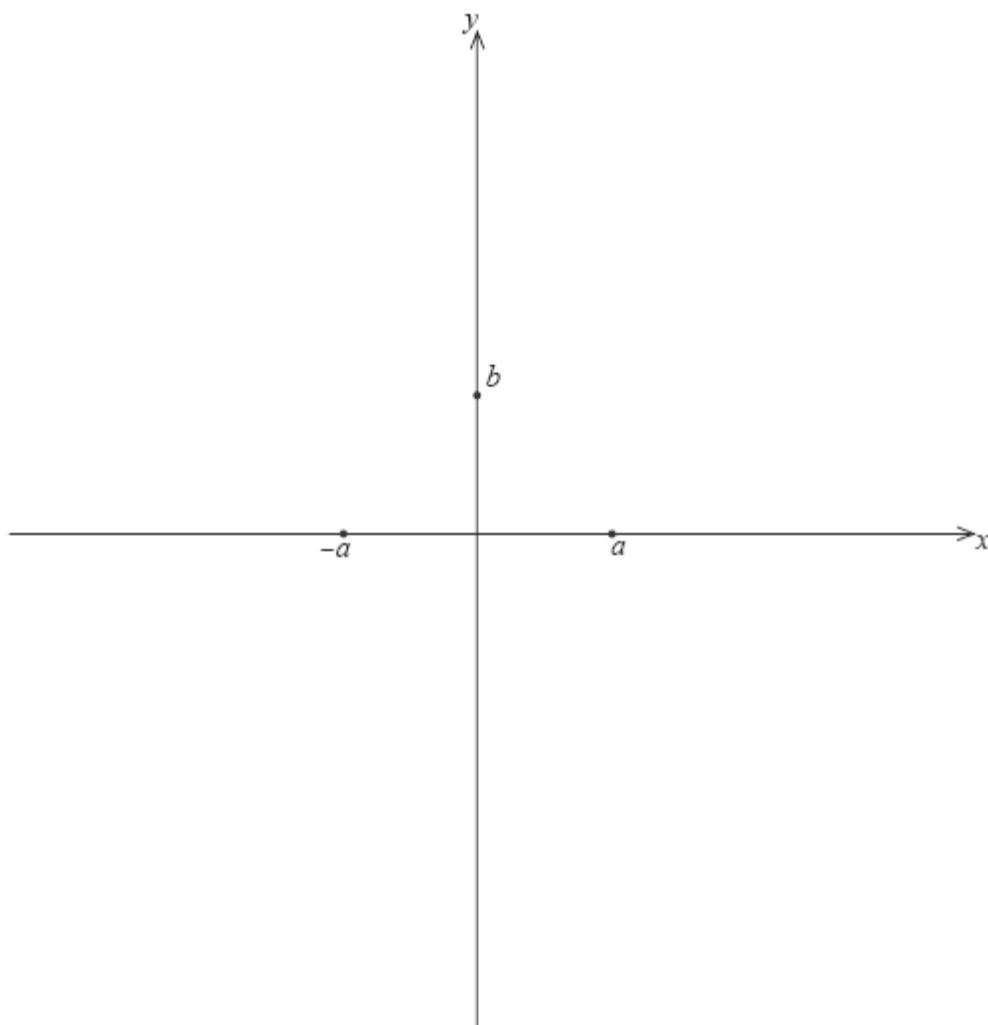
2. The diagram below shows the graph of the function  $y = f(x)$ , defined for all  $x \in \mathbb{R}$ , where  $b > a > 0$ .



Consider the function  $g(x) = \frac{1}{f(x-a)-b}$ .

(a) Find the largest possible domain of the function  $g$ . (2)

- (b) On the axes below, sketch the graph of  $y = g(x)$ . On the graph, indicate any asymptotes and local maxima or minima, and write down their equations and coordinates.



(6)  
(Total 8 marks)

3. The quadratic function  $f(x) = p + qx - x^2$  has a maximum value of 5 when  $x = 3$ .

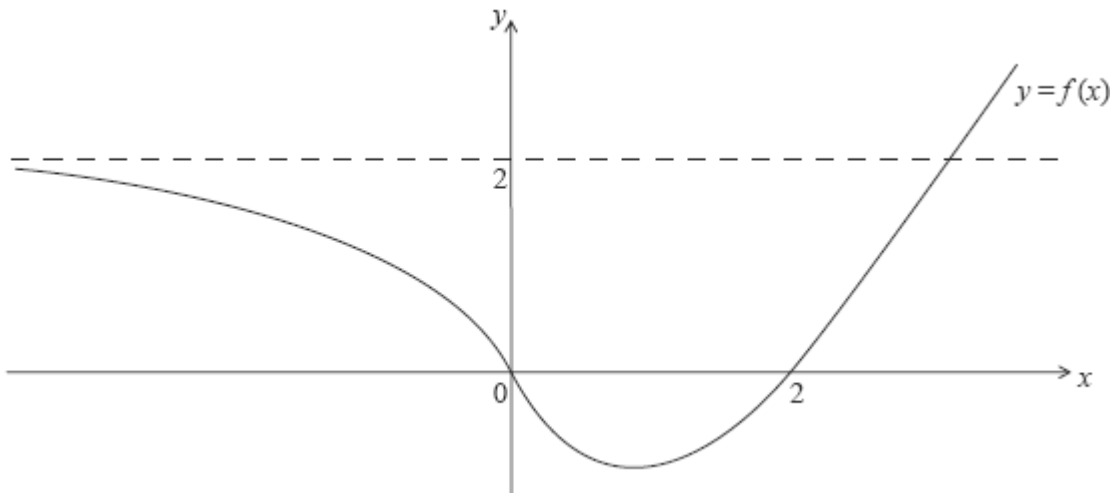
- (a) Find the value of  $p$  and the value of  $q$ .

(4)

- (b) The graph of  $f(x)$  is translated 3 units in the positive direction parallel to the  $x$ -axis. Determine the equation of the new graph.

(2)  
(Total 6 marks)

4. The diagram shows the graph of  $y = f(x)$ . The graph has a horizontal asymptote at  $y = 2$ .



- (a) Sketch the graph of  $y = \frac{1}{f(x)}$ .

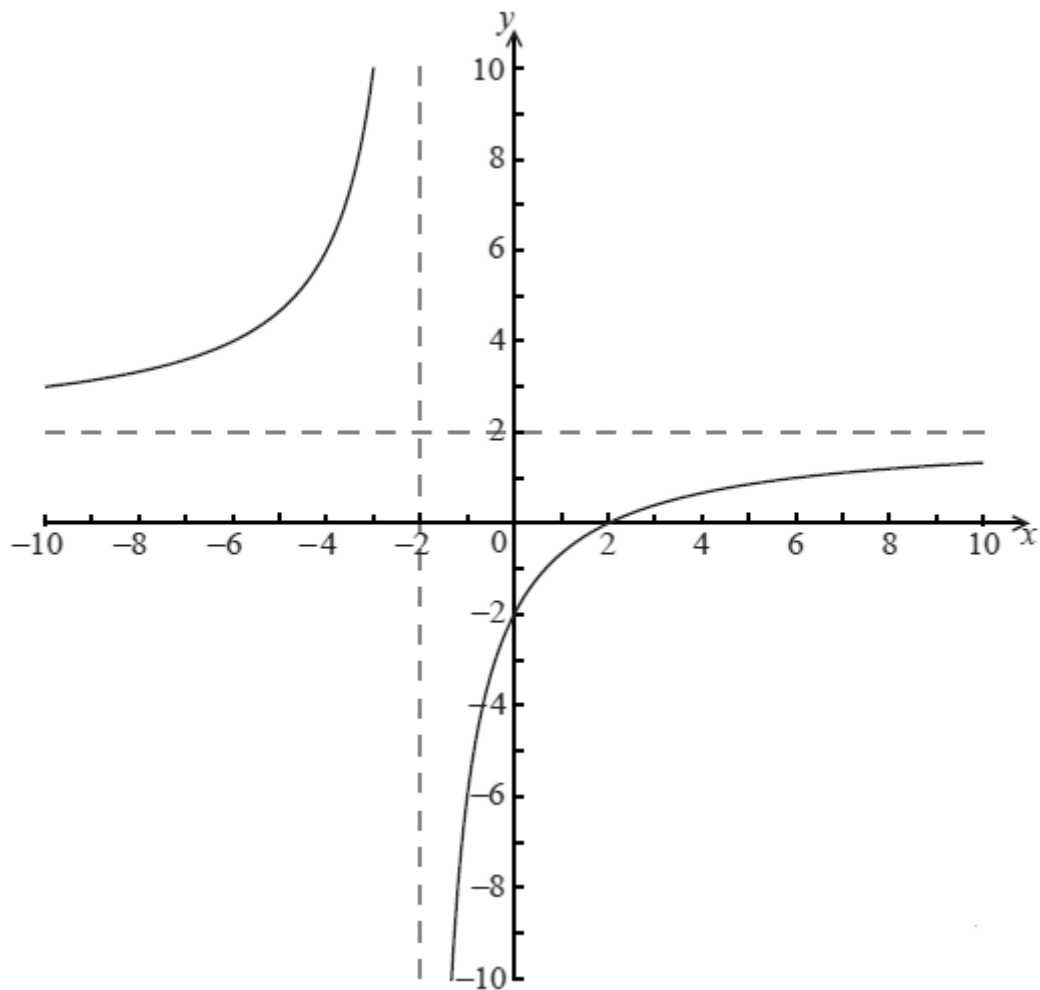
(3)

- (b) Sketch the graph of  $y = x f(x)$ .

(3)

(Total 6 marks)

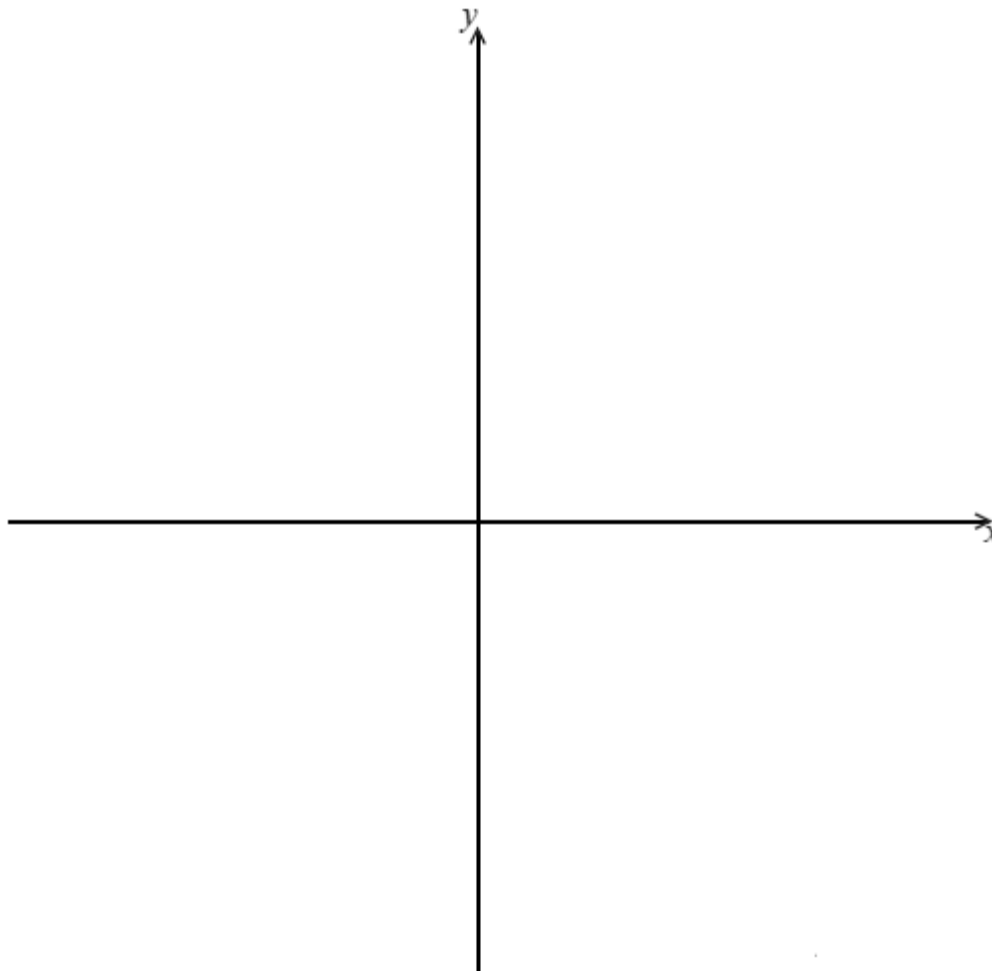
5. The graph of  $y = \frac{a+x}{b+cx}$  is drawn below.



- (a) Find the value of  $a$ , the value of  $b$  and the value of  $c$ .

(4)

- (b) Using the values of  $a$ ,  $b$  and  $c$  found in part (a), sketch the graph of  $y = \left| \frac{b+cx}{a+x} \right|$  on the axes below, showing clearly all intercepts and asymptotes.



(4)  
(Total 8 marks)