

Rational Functions Quiz Review

Paper 1

1. Let $g(x) = \frac{1}{x}$, $h(x) = \frac{5}{x-4}$, $x \neq 4$.

- (a) The graph of h is a transformation of the graph of g . State the transformations.

The graph of g is transformed to the graph of f by a translation of $\begin{pmatrix} -1 \\ 2 \end{pmatrix}$.

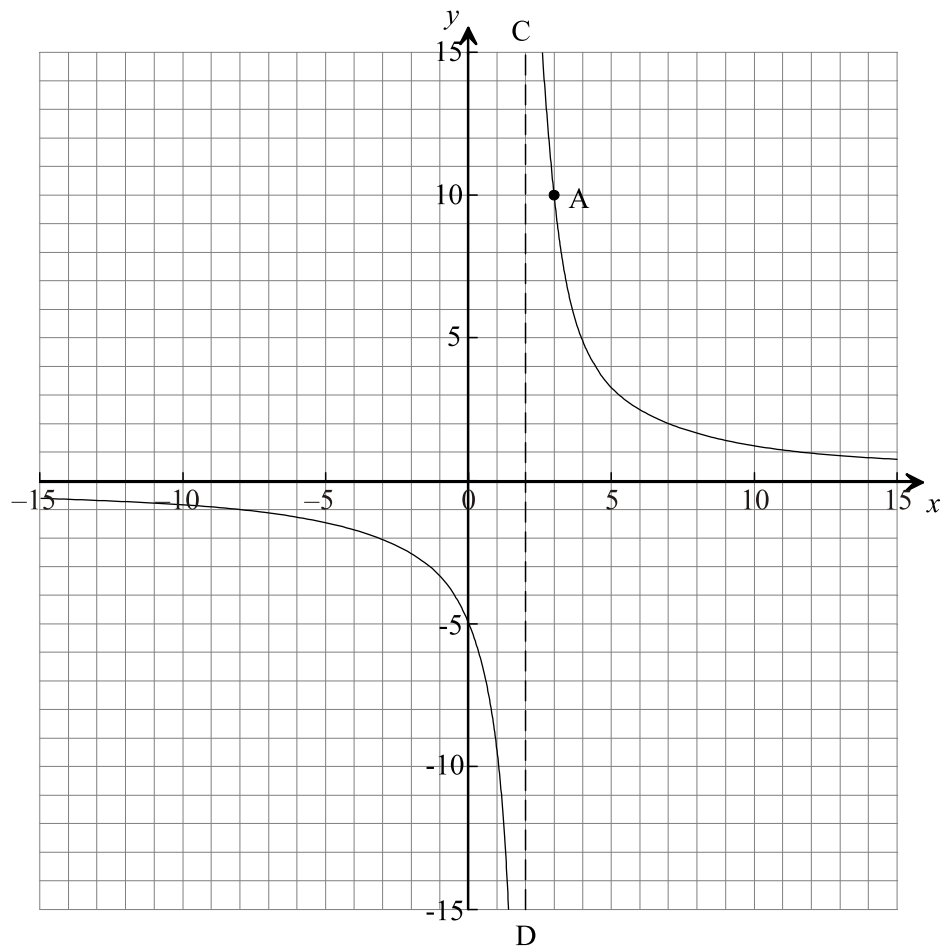
- (b) Find an expression for $f(x)$.

- (c) Sketch the graph of $f(x)$.

(Total 6 marks)

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2. (a) The diagram shows part of the graph of the function $f(x) = \frac{q}{x-p}$. The curve passes through the point A (3, 10). The line (CD) is an asymptote.

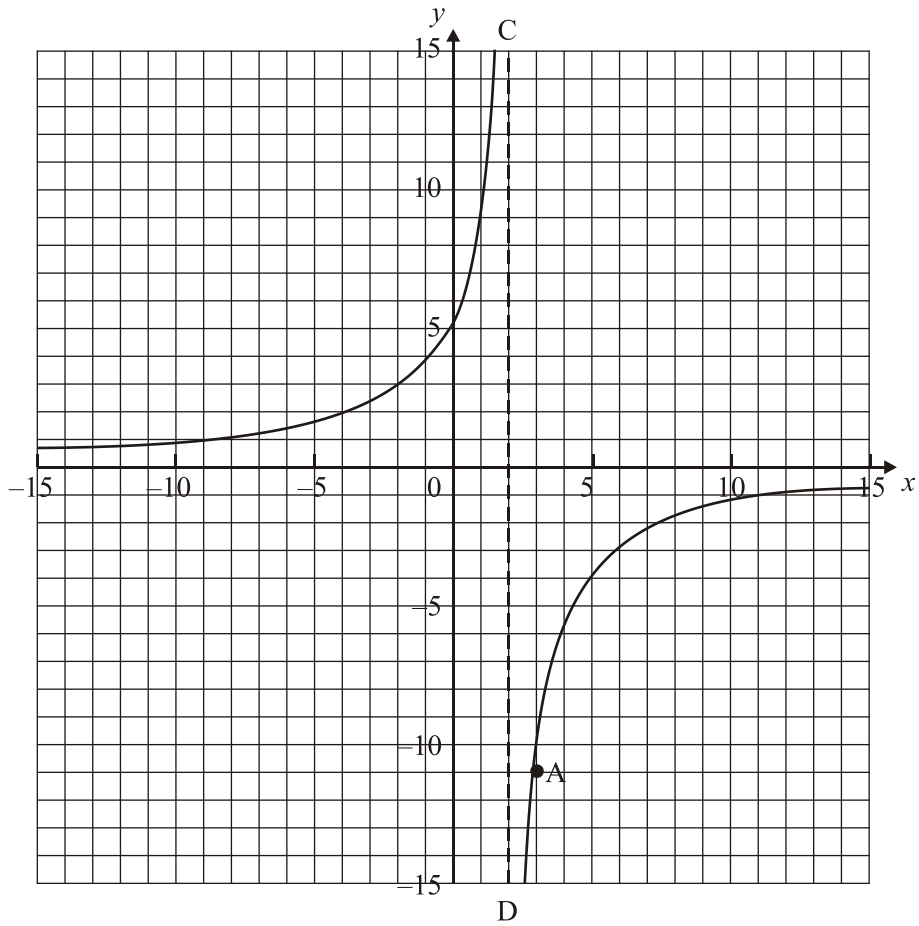


Find the value of

- (i) p ;
- (ii) q .

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- (b) The graph of $f(x)$ is transformed as shown in the following diagram. The point A is transformed to $A'.$



Give a full geometric description of the transformation.

Working:

Answers:

- (a) (i)
- (ii)
- (b)
-

(Total 6 marks)

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3. Consider the functions f and g where $f(x) = 3x - 5$ and $g(x) = x - 2$.

(a) Find the inverse function, f^{-1} . (3)

(b) Given that $g^{-1}(x) = x + 2$, find $(g^{-1} \circ f)(x)$. (2)

(c) Given also that $(f^{-1} \circ g)(x) = \frac{x+3}{3}$, solve $(f^{-1} \circ g)(x) = (g^{-1} \circ f)(x)$. (2)

Let $h(x) = \frac{f(x)}{g(x)}$, $x \neq 2$.

(d) (i) **Sketch** the graph of h for $-3 \leq x \leq 7$ and $-2 \leq y \leq 8$, including any asymptotes.

(ii) Write down the **equations** of the asymptotes. (5)

The expression $\frac{3x-5}{x-2}$ may also be written as $3 + \frac{1}{x-2}$. Use this to answer the following.

(e) State the transformation from $\frac{1}{x}$.

(Total 12 marks)

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4. The function f is given by

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

(a) (i) Show that $y = 2$ is an asymptote of the graph of $y = f(x)$. (2)

(ii) Find the vertical asymptote of the graph. (1)

(iii) Write down the coordinates of the point P at which the asymptotes intersect. (1)

(b) Find the points of intersection of the graph and the axes. (4)

(c) Hence sketch the graph of $y = f(x)$, showing the asymptotes by dotted lines. (4)

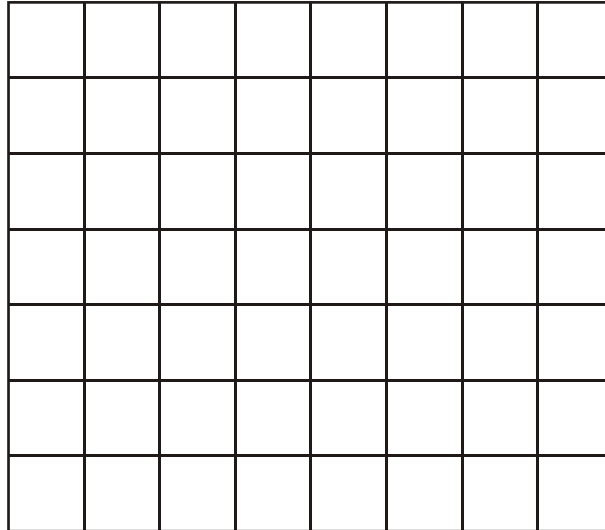
(Total 12 marks)

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Paper 2

5. The function f is defined by $f(x) = \frac{3}{\sqrt{9-x^2}}$, for $-3 < x < 3$.

(a) On the grid below, sketch the graph of f .



(b) Write down the equation of each vertical asymptote.

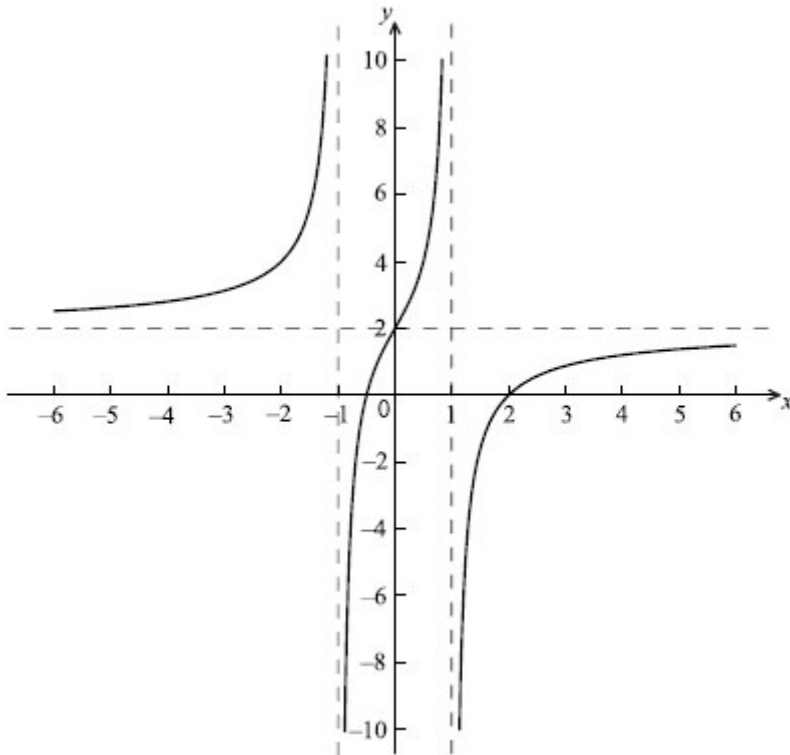
(c) Write down the range of the function f .

(Total 6 marks)

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6. Let $f(x) = p - \frac{3x}{x^2 - q^2}$, where $p, q \in \mathbb{R}^+$.

Part of the graph of f , including the asymptotes, is shown below.



(a) The equations of the asymptotes are $x=1$, $x=-1$, $y=2$. Write down the value of

(i) p ;

(ii) q .

(2)

(Total 2 marks)