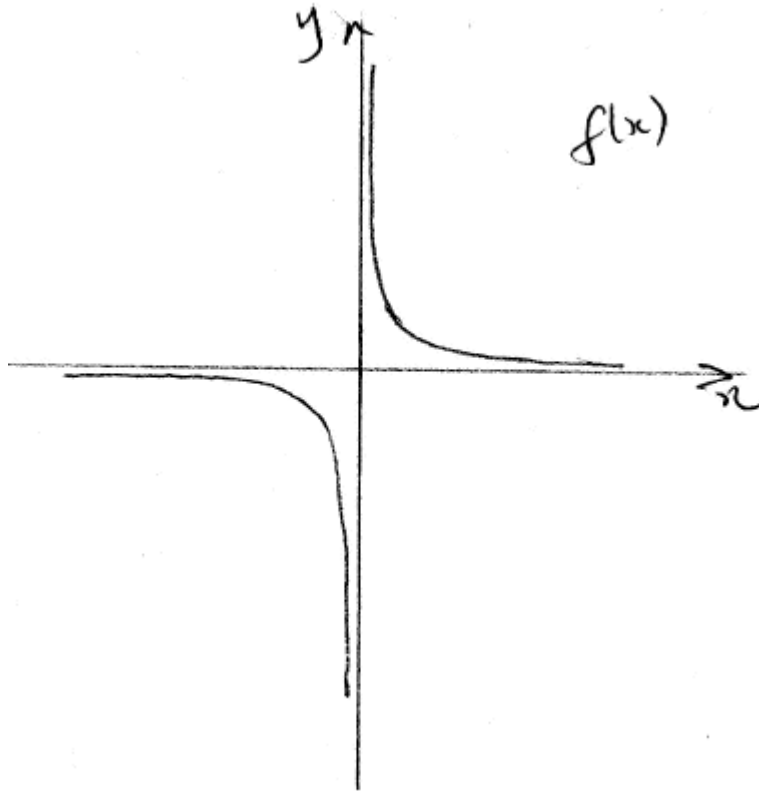


Rational Functions Quiz Paper 1 KEY

1. (a)



A1A1 N2

*Note: Award A1 for the left branch, and A1 for the right branch.*

(b)  $g(x) = \frac{1}{x-2} + 3$

A1A1 N2

(c) (i) Evidence of using  $x = 0$   $\left( g(0) = -\frac{1}{2} + 3 \right)$

(M1)

$y = \frac{5}{2}$  (= 2.5)

A1

evidence of solving  $y = 0$   $(1 + 3(x - 2) = 0)$

M1

$1 + 3x - 6 = 0$

(A1)

$3x = 5$

$x = \frac{5}{3}$

A1

Intercepts are  $x = \frac{5}{2}$ ,  $y = \frac{5}{3}$  (accept)  $\left( \frac{5}{3}, 0 \right)$   $\left( 0, \frac{5}{2} \right)$

N3

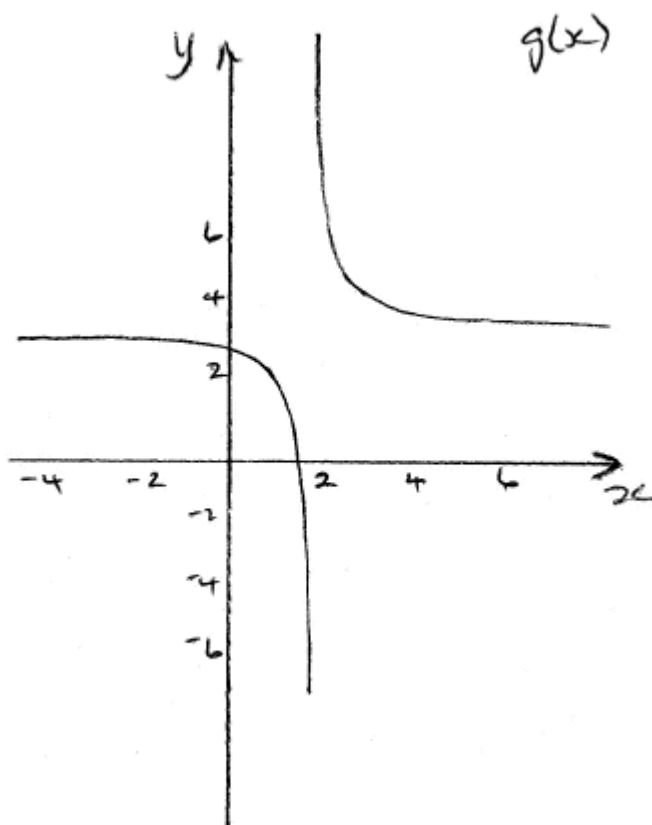
(ii)  $x = 2$   
 $y = 3$

A1 N1

A1 N1

Rational Functions Quiz Paper 1 KEY

(iii)



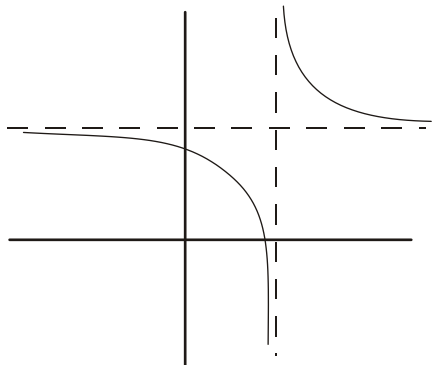
A1A1A1 N3

**Note:** Award A1 for the shape (both branches), A1 for the correct behaviour close to the asymptotes, and A1 for the intercepts at approximately  $\left(\frac{5}{3}, 0\right)$   $\left(0, \frac{5}{2}\right)$ .

[14]

Rational Functions Quiz Paper 1 KEY

2. (a)



A1A1A1 N3

*Notes:* Award A1 for **both** asymptotes shown.  
The asymptotes need not be labelled.

Award A1 for the left branch in **approximately** correct position,

A1 for the right branch in **approximately** correct position.

(b) (i)  $y = 3, x = \frac{5}{2}$  (must be equations)

A1A1 N2

(ii)  $x = \frac{14}{6} \left( \frac{7}{3} \text{ or } 2.33, \text{ also accept } \left( \frac{14}{6}, 0 \right) \right)$

A1 N1

(iii)  $y = \frac{14}{6} \text{ (} y = 2.8 \text{)} \left( \text{accept } \left( 0, \frac{14}{5} \right) \text{ or } (0, 2.8) \right)$

A1 N1

(iv)  $D: \{x | x \in \mathbb{R}, x \neq \frac{5}{2}\}$

A1 N1

(v)  $R: \{y | y \in \mathbb{R}, y \neq 3\}$

A1 N1

**Rational Functions Quiz Paper 1 KEY**

1a. interchanging  $x$  and  $y$  (M1)

eg  $x = 3y - 2$

$f^{-1}(x) = \frac{x+2}{3}$  (accept  $y = \frac{x+2}{3}, \frac{x+2}{3}$ ) A1 N2

[2 marks]

1b. attempt to form composite (in any order) (M1)

eg  $g\left(\frac{x+2}{3}\right), \frac{\frac{5}{3x}+2}{3}$

correct substitution A1

eg  $\frac{5}{3\left(\frac{x+2}{3}\right)}$

$(g \circ f^{-1})(x) = \frac{5}{x+2}$  AG N0

[2 marks]

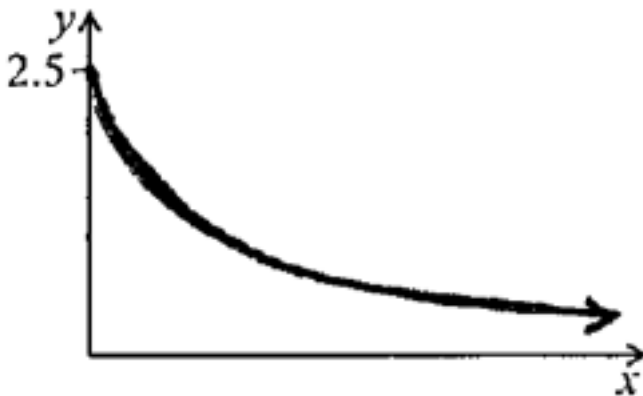
1c. valid approach (M1)

eg  $h(0), \frac{5}{0+2}$

$y = \frac{5}{2}$  (accept (0, 2.5)) A1 N2

[2 marks]

1d.



A1A2 N3 [3 marks]

**Notes:** Award A1 for approximately correct shape (reciprocal, decreasing, concave up).

**Only** if this A1 is awarded, award A2 for all the following approximately correct features: y-intercept at (0, 2.5), asymptotic to x-axis, correct domain  $x \geq 0$ .

If only two of these features are correct, award A1.

**Rational Functions Quiz Paper 1 KEY**

1e.  $x = \frac{5}{2}$  (accept (2.5, 0)) *A1 N1*

[1 mark]

1f.  $x = 0$  (must be an equation) *A1 N1*

[1 mark]

**1g. METHOD 1**

attempt to substitute **3** into ***h*** (seen anywhere) (***M1***)

eg  $h(3), \frac{5}{3+2}$

correct equation (***A1***)

eg  $a = \frac{5}{3+2}, h(3) = a$

$a = 1$  *A1 N2*

[3 marks]

**METHOD 2**

attempt to find inverse (may be seen in (d)) (***M1***)

eg  $x = \frac{5}{y+2}, h^{-1} = \frac{5}{x} - 2, \frac{5}{x} + 2$

correct equation,  $\frac{5}{x} - 2 = 3$  (***A1***)

$a = 1$  *A1 N2*

[3 marks]