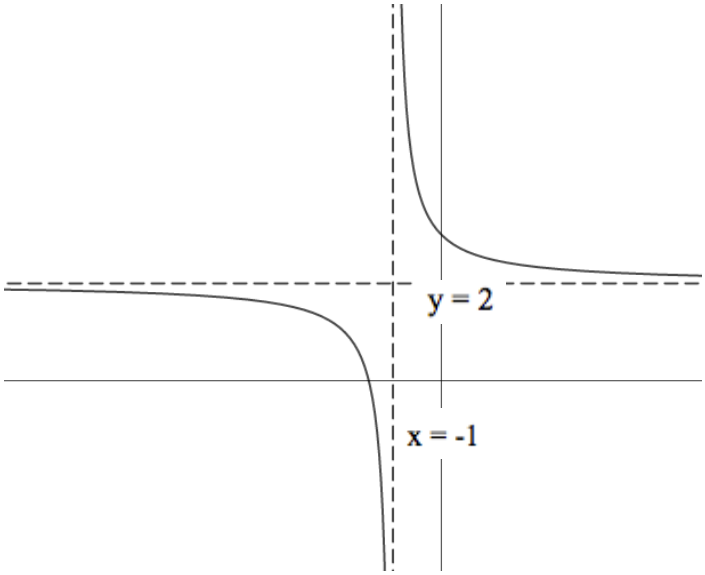
Rational Functions Quiz Review KEY

1. (a) horizontal translation of 4 units; $\begin{pmatrix}4\\0\end{pmatrix}$; shift right 4 units A1

vertical stretch by a factor of 5 A1 N2

(b) $f(x) = \frac{1}{x+1} + 2$ A2 N2

(c)



A2 N2

***Note**: Award A1 for two branches of correct shape, A1 for both asymptotes.*

[6]

2. (a) (i) $p = 2$ (A2) (C2)

(ii) $10 = \frac{q}{3-2}$ (or equivalent) (M1)

$q = 10$ (A1) (C2)

(b) Reflection, in x-axis (A1)(A1) (C2)

[6]

Rational Functions Quiz Review KEY

3. (a) **METHOD 1**

Attempting to interchange x and y (M1)

Correct expression $x = 3y - 5$ (A1)

$f^{-1}(x) = \frac{x+5}{3}$ A1 N3

METHOD 2

Attempting to solve for x in terms of y (M1)

Correct expression $x = \frac{y+5}{3}$ (A1)

$f^{-1}(x) = \frac{x+5}{3}$ A1 N3

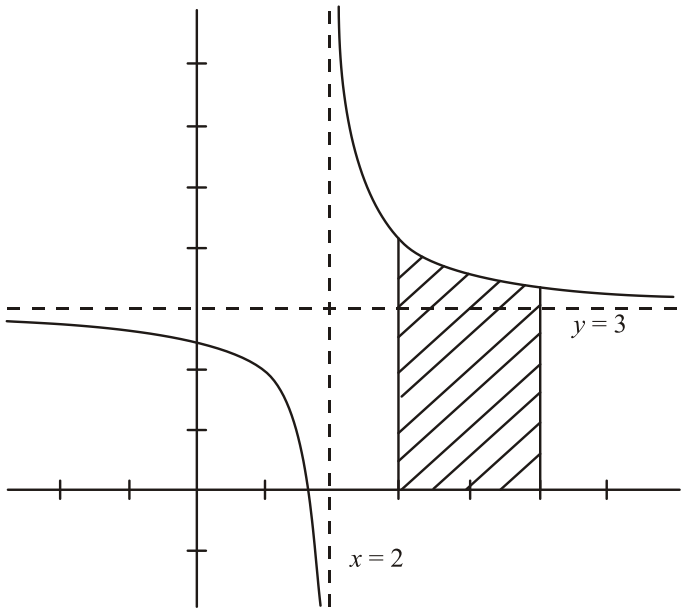
(b) For correct composition $(g^{-1} \circ f)(x) = (3x - 5) + 2$ (A1)

$(g^{-1} \circ f)(x) = 3x - 3$ A1 N2

(c) $\frac{x+3}{3} = 3x - 3 \quad (x + 3 = 9x - 9)$ (A1)

$x = \frac{12}{8}$ A1 N2

(d) (i)



A1A1A1 N3

***Note**: Award A1 for approximately correct x and y intervals, A1 for two branches of correct shape, A1 for both asymptotes.*

(ii) (Vertical asymptote) $x = 2$, (Horizontal asymptote) $y = 3$ A1A1 N2

(Must be equations)

[12]

Rational Functions Quiz Review KEY

4. (a) (i) $f(x) = \dfrac{2x+1}{x-3}$

$= 2 + \dfrac{7}{x-3}$ by division or otherwise (M1)

Therefore as $|x| \to \infty\ f(x) \to 2$ (A1)

$\Rightarrow y = 2$ is an asymptote (AG)

OR $\lim\limits_{x\to\infty} \dfrac{2x+1}{x-3} = 2$ (M1)(A1)

$\Rightarrow y = 2$ is an asymptote (AG)

OR make x the subject

$yx - 3y = 2x + 1$

$x(y-2) = 1 + 3y$ (M1)

$x = \dfrac{1+3y}{y-2}$ (A1)

$\Rightarrow y = 2$ is an asymptote (AG)

Note: *Accept inexact methods based on the ratio of the coefficients of x.*

(ii) Asymptote at $x = 3$ (A1)

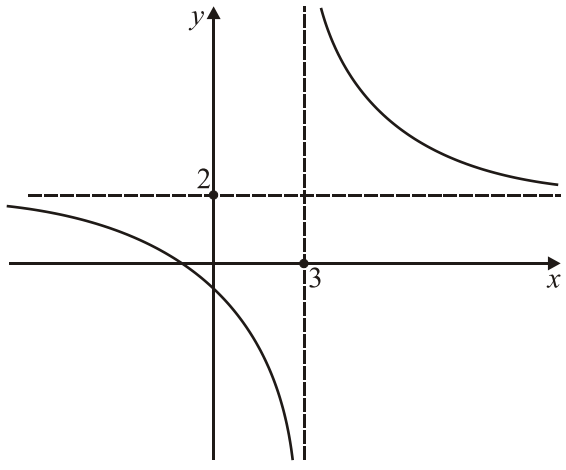
(iii) $P(3, 2)$ (A1) 4

(b) $f(x) = 0 \Rightarrow x = -\dfrac{1}{2}$ $\left(-\dfrac{1}{2}, 0\right)$ (M1)(A1)

$x = 0 \Rightarrow f(x) = -\dfrac{1}{3}$ $\left(0, -\dfrac{1}{3}\right)$ (M1)(A1) 4

Note: *These do not have to be in coordinate form.*

(c)



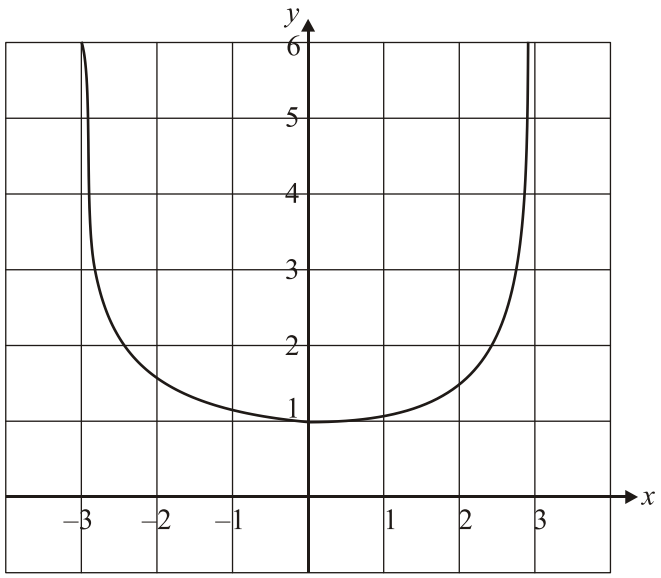
(A4) 4

Note: *Asymptotes (A1)*
Intercepts (A1)
"Shape" (A2).

[12]

Rational Functions Quiz Review KEY

5. (a)



A1A1 2

***Note**: Award (A1) for the general shape and (A1) for the j-intercept at 1.*

(b) $x = 3, \quad x = -3$ A1A1 2

(c) $y \geq 1$ A2 2

***Note**: Award N1 for $y > 1$.*

[6]

6. (a) (i) $p = 2$ A1 N1

(ii) $q = 1$ A1 N1

[2]