

FP1 Graphs Rational Functions Answers

4(a)	Asymptotes $x = 1, y = 6$	B1B1	2	
(b)	Curve (correct general shape)	M1		SC Only one branch:
	Curve passing through origin	A1		B1 for origin
	Both branches approaching $x = 1$	A1		B1 for approaching both asymptotes
	Both branches approaching $y = 6$	A1	4	(Max 2/4)
(c)	Correct method	M1		
	Critical values ± 1	B1B1		From graph or calculation
	Solution set $-1 < x < 1$	A1 \checkmark	4	ft one error in CVs; NMS 4/4 after a good graph
Total			10	

9(a)(i)	Intersections at $(-1, 0), (3, 0)$	B1B1	2	Allow $x = -1, x = 3$
(ii)	Asymptotes $x = 0, x = 2, y = 1$	B1 \times 3	3	
(b)(i)	$y = k \Rightarrow kx^2 - 2kx = x^2 - 2x - 3$	M1A1		M1 for clearing denominator
	$\dots \Rightarrow (k-1)x^2 + (-2k+2)x + 3 = 0$	A1 \checkmark		ft numerical error
	$\Delta = 4(k-1)(k-4)$, hence result	m1A1	5	convincingly shown (AG)
(ii)	$y = 4$ at SP	B1		
	$3x^2 - 6x + 3 = 0$, so $x = 1$	M1A1	3	A0 if other point(s) given
(c)	Curve with three branches	B1		approaching vertical asymptotes
	Middle branch correct	B1		Coordinates of SP not needed
	Other two branches correct	B1	3	3 asymptotes shown
Total			16	

5(a)	Asymptotes $y = 0, x = -1, x = 1$	B1 \times 3	3	
(b)	Three branches approaching two vertical asymptotes	B1		Asymptotes not necessarily drawn
	Middle branch passing through O	B1		with no stationary points
	Curve approaching $y = 0$ as $x \rightarrow \pm \infty$	B1		
	All correct	B1	4	with asymptotes shown and curve approaching all asymptotes correctly
(c)	Critical values $x = -1, 0$ and 1	B1		
	Solution set $-1 < x < 0, x > 1$	M1A1	3	M1 if one part correct or consistent with c's graph
Total			10	

7(a)	Asymptotes $x = -2, y = 3$	B1,B1	2	
(b)	<p>A Cartesian coordinate system showing a rational function. The x-axis and y-axis are shown. A vertical dashed line represents the asymptote $x = -2$ and a horizontal dashed line represents the asymptote $y = 3$. The origin is labeled O. The curve has two branches: one in the upper-left region (relative to the asymptotes) that approaches $x = -2$ from the right and $y = 3$ from below; the other branch is in the lower-right region, passing through the x-axis at $x = \frac{1}{3}$ and the y-axis at $y = -\frac{1}{2}$.</p>	B1		Curve approaching asymptotes
		B1,B1		Passing through $\left(\frac{1}{3}, 0\right)$ and $\left(0, -\frac{1}{2}\right)$
		B1,B1	5	Both branches generally correct B1 if two branches shown
(c)	Solution set is $x > \frac{1}{3}$	B2,1F	2	B1 for good attempt; ft wrong point of intersection
Total			9	