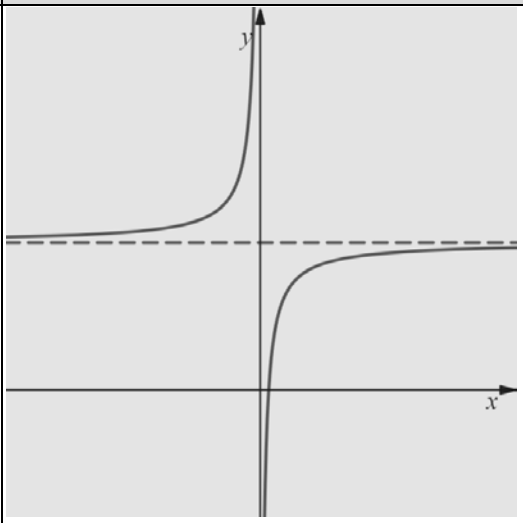
Question	Scheme	Marks	AOs
8 (a)	 Shape	B1	1.1b
	Asymptote $y = k$	B1	1.1b
	Intercept $\left(\frac{1}{2k}, 0\right)$	B1	1.1b
		(3)	
(b)	Sets $k - \frac{1}{2x} = 2x + 3 \Rightarrow$ 3TQ	M1	3.1a
	$4x^2 + (6 - 2k)x + 1 = 0$	A1	1.1b
	Uses $b^2 - 4ac...0 \Rightarrow (6-2k)^2 - 16...0 \Rightarrow k =$	M1	2.1
	Correct critical values $k = 1, 5$	A1	1.1b
	Selects outside region	M1	2.2a
	A correct range E.g. $\{k : k < 1\} \cup \{k : k > 5\}$	A1	2.5
		(6)	
			(9 marks)

Notes:

(a)

See scheme

(b)

M1: For the key step of setting the equations equal to each other and proceeding to a 3TQ in *x*.

A1: For a correct 3TQ with the terms collected, which may be implied by correct values for a, b and *c*.

M1: Attempts to use the discriminant condition to find at least one critical value

A1: Correct critical values

M1: Selects the outside region

A1: Correct answer given in set notation.

E.g. $\{k : k < 1\} \cup \{k : k > 5\}$, $\{k \in \mathbb{R} : 0 < k < 1 \text{ or } k > 5\}$, $k \in (-\infty, 1) \cup (5, \infty)$

.....

Alternative solution via differentiation: The first 3 marks may be awarded as follows.

M1: At the points where $y = 2x + 3$ is a tangent $\frac{\mathrm{d}}{\mathrm{d}x}\left(k - \frac{1}{2x}\right) = 2$ **A1:** $\frac{1}{2}x^{-2} = 2 \Rightarrow x = \pm\frac{1}{2}$

M1: Substitutes their $\left(\frac{1}{2}, 4\right)$ or $\left(-\frac{1}{2}, 2\right)$ into $y = k - \frac{1}{2x}$ to find at least one critical value.