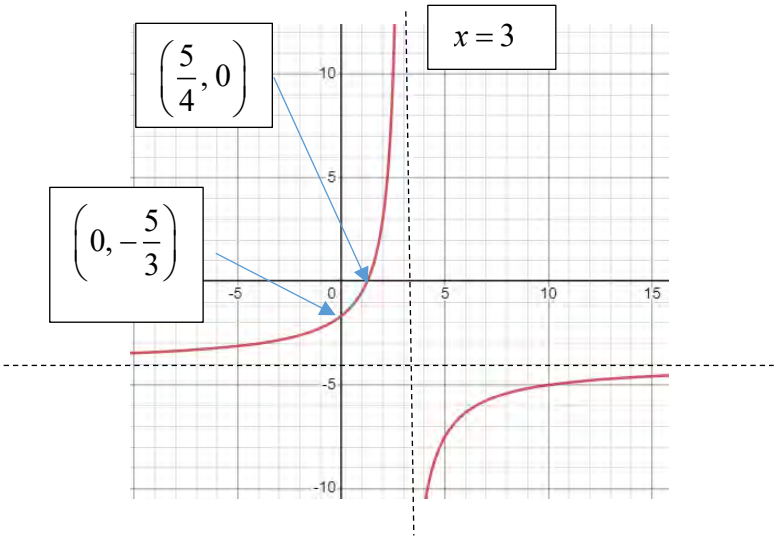
Question	Scheme	Marks
10(a)	$\left(ax-5=0,\ x=\frac{5}{4}\Rightarrow\right)a=4$ $\left(\text{Line parallel to the } y\text{-axis is } x=3\Rightarrow\right)b=3$	B1 B1 {2]
(b)		B1 B1ftB1 B1ftB1ft [5]
(c)	$\left(\frac{dy}{dx}=\right)\frac{(3-x)(4)-(4x-5)(-1)}{(3-x)^2}=\left[\frac{7}{(3-x)^2}\right]$ (Gradient of l =) $\frac{7}{4}$ $\frac{7}{4}=\frac{7}{(3-x)^2}\Rightarrow(3-x)^2=4\Rightarrow3-x=\pm2\Rightarrow x=1,5$ When $x=1$, $y=-\frac{1}{2}$ and when $x=5$, $y=-\frac{15}{2}$ Equation of line when $x=1$: $y--\frac{1}{2}=\frac{7}{4}(x-1)\Rightarrow4y-7x=-9$ Equation of line when $x=5$: $y--\frac{15}{2}=\frac{7}{4}(x-5)\Rightarrow4y-7x=-65$ $\Rightarrow-65<k<-9$	M1 B1 M1A1 M1 A1 (B1B1 on ePen) ddM1 ddM1 A1 [9]

ALT	$(y=)\dfrac{7x+k}{4}=\dfrac{"4"x-5}{"3"-x}$ oe $4\left(\dfrac{"4"x-5}{"3"-x}\right)-7x=k$ oe	M1 A1(B1 on ePen)
	$16x-20=(7x+k)("3"-x)$ oe	
	$16x-20=21x-7x^2+3k-kx \Rightarrow 7x^2+kx-5x-20-3k(=0)$ oe	M1 A1
	$(\Rightarrow 7x^2+(k-5)x-20-3k(=0))$ oe	
	$(k-5)^2-4(7)(-20-3k)(<0)$	M1A1 (B1 B1 on ePen)
	$k^2+74k+585(<0)$	
	$(k=)\dfrac{-74\pm\sqrt{(74)^2-4\times(1)\times585}}{2}$ or $(k-9)(k-65)(=0)$	ddM1 ddM1
	$-65<k<-9$	A1 [9]

Part	Mark	Notes
(a)	B1	For the value of $a = 4$ or $b = 3$
	B1	For the value of $a = 4$ and $b = 3$
Note: These are independent of method marks, not given answers. Unless the answers come from **very obviously** incorrect working, these marks should be awarded for sight of the correct values.		
(b)	B1	For a negative reciprocal curve drawn anywhere in the grid – there **must** be two branches present, they **must not** cross any asymptotes drawn and **must not <u>obviously</u>** 'bend back' on themselves. Mark intention.
	For the following marks, where candidates have used incorrect values of a and b, examiners will find using desmos.com or similar packages useful. Type into desmos $y = (ax – b)/(b – x)$ and add 'sliders' for a and b	
	B1ft	For the horizontal asymptote of $y = -4$ drawn in the correct place and labelled with its equation or where the line passes through the axis. There **must** be at least one branch of a reciprocal curve present which **must** not cross or **obviously** bend back from the asymptote(s) ignore any other curves present. Allow follow through **only** of $y = -$ (their a) and only if other conditions met.
	B1	For the vertical asymptote $x = 3$ drawn in the correct place. There **must** be at least one branch of a reciprocal curve present which **must** not cross or **obviously** bend back from the asymptote(s), ignore any other curves present.
	B1ft	A single curve (or even line) passing through $\left(0, -\frac{5}{3}\right)$ marked clearly on the graph as a coordinate or as a crossing point on the axis. Ignore any other branches present. Allow follow through only of $\left(0, -\frac{5}{\text{their } b}\right)$
	B1ft	A single curve (or even line) passing through both $\left(\frac{5}{4}, 0\right)$ and $\left(0, -\frac{5}{3}\right)$ both marked clearly on the graph as a coordinate or as crossing points on the axes. Ignore any other branches present. Allow follow through only of $\left(0, -\frac{5}{\text{their } b}\right)$

(c)	M1	For applying the quotient (or product rule). • With two terms in the numerator subtracted either way around. • The differentiation on both terms must be correct. • The denominator must be squared. $\frac{(3-x)(4)-(4x-5)(-1)}{(3-x)^2}$ or $\frac{(4x-5)(-1)-(3-x)(4)}{(3-x)^2}$ (if using quotient rule) Or $4(3-x)^{-1} \pm (4x-5)(3-x)^{-2}$ (if using product rule)
	B1	For (Gradient of l =) $\frac{7}{4}$
	M1	For correctly setting their gradient of l = to their derivative and an attempt to solve to find 2 values of x. Allow one error in rearrangement. Their derivative must be of the form $\frac{rx+s}{(3-x)^2}$ s **or** r could be 0, but not both
	A1	For x = 1 **and** 5
	M1 (B1 on ePen)	For substitution of either of their x values into the equation of their curve.
	A1 (B1 on ePen)	For $y=-\frac{1}{2}$ **and** $y=-\frac{15}{2}$
	ddM1	For correctly forming an equation of the line for either pair of their values and their gradient and rearranging (allow errors in rearrangement) to the form $4y-7x=k$. Dependent on 1st 2 method marks.
	ddM1	For correctly forming an equation of the line for both pairs of their values and their gradient and rearranging (allow rearrangement errors) to the form $4y-7x=k$ Dependent on 1st 2 method marks.
	A1	For the correct inequality as shown.
ALT	M1	For rearrangement of l to the form $y=\frac{7}{4}x+c \quad c\neq 0$ and placing equal to their equation of C or substitution of the equation for curve C in the equation for l. Allow $4\left(\frac{"4"x-5}{"3"-x}\right)=k\pm 7x$ Condone using an inequality sign, follow through their a and b
	A1 (B1 on ePen)	For a correct unsimplified equation. **DO NOT** condone using an inequality sign
	M1	For an attempt to rearrange their equation of the form $mx+c=\frac{4x-5}{3-x} \quad m,c\neq 0$, to allow them to reach a "3TQ", allow one error in rearrangement. Condone using an inequality sign By "3TQ", we means terms in x, x^2 and constant, all on 'one side' even if the equals sign is missing or an incorrect inequality sign is shown, terms simplified where possible.
	A1	For the correct "3TQ" shown (oe), the term in x does not have to be factorised and = 0 may be omitted. "3TQ" defined as above
	M1 (B1 on ePen)	For the correct formulation of the discriminant from their "3TQ". Inequality sign doesn't need to be shown or can be incorrect.
	A1 (B1 on ePen)	For the correct unsimplified discriminant. Inequality sign doesn't need to be shown or can be correct.
	ddM1	For a correct method to solve their quadratic equation in k, leading to a value of k. Dependent on first 2 method marks. Mark awarded for the correct **method.**
	ddM1	For a correct method to solve their quadratic equation in k, leading to two values of k. Dependent on 1st 2 method marks. Mark awarded for the correct **method.**
	A1	For the inequality shown.