Question Number	Scheme	Notes	Marks
5	$\frac{x^2}{25}-\frac{y^2}{4}=1 \quad y=mx+c$		
(a)	$\frac{x^2}{25}-\frac{(mx+c)^2}{4}=1 \Rightarrow 4x^2-25\left(m^2x^2+2cmx+c^2\right)=100$ Substitutes to obtain a quadratic in x and eliminates fractions		M1
	$4x^2-25\left(m^2x^2+2cmx+c^2\right)=100$ $\left(\Rightarrow \left(25m^2-4\right)x^2+50cmx+25c^2+100=0\right)$ Correct 3TQ		A1
	$"b^2=4ac" \Rightarrow (50cm)^2=4\left(25m^2-4\right)\left(25c^2+100\right)$ Uses '$b^2 = 4ac$' or equivalent		M1
	$2500c^2m^2=2500c^2m^2+10000m^2-400c^2-1600$ $10000m^2=400c^2+1600$ $25m^2=c^2+4*$ Fully correct proof with no errors		A1*
			(4)
ALT 1	Using hyperbolic parameters:		
	$x=5\cosh t, y=2\sinh t \Rightarrow \frac{dy}{dx}=\frac{2\cosh t}{5\sinh t}$		
	$\frac{2\cosh t}{5\sinh t}(x-5\cosh t)=y-2\sinh t$ M1: Attempts the equation of the tangent A1: Correct equation (no simplification needed)		M1A1
	$y=\frac{2\cosh t}{5\sinh t}x-\frac{2\cosh^2 t-25\sinh^2 t}{\sinh t}$		
	$25m^2=\frac{4\cosh^2 t}{\sinh^2 t},\ 4+c^2=4+\frac{4}{\sinh^2 t}=\frac{4\left(\sinh^2 t+1\right)}{\sinh^2 t}=\frac{4\cosh^2 t}{\sinh^2 t}$ Extracts $25m^2$ and $4 + c^2$ from their equation		M1
	$\therefore 25m^2=4+c^2 \quad *$ Fully correct proof with no errors		A1*
			(4)
ALT 2	Using trigonometric parameters:		
	$x=5\sec t, y=2\tan t \Rightarrow \frac{dy}{dx}=\frac{2\sec t}{5\tan t}$		
	$\frac{2\sec t}{5\tan t}(x-5\sec t)=y-2\tan t$ M1: Attempts the equation of the tangent A1: Correct equation (no simplification needed)		M1A1
	$y=\frac{2\sec t}{5\tan t}x+\frac{2\tan^2 t-2\sec^2 t}{\tan t}$		
	$25m^2=\frac{4\sec^2 t}{\tan^2 t}=\frac{4}{\sin^2 t} \quad 4+c^2=4\left(1+\frac{1}{\tan^2 t}\right)=4\left(\frac{\sin^2 t+\cos^2 t}{\sin^2 t}\right)=\frac{4}{\sin^2 t}$ Extracts $25m^2$ and $4 + c^2$ from their equation		M1
	$\therefore 25m^2=4+c^2 \quad *$ Fully correct proof with no errors		A1*
			(4)

(b)	$25m^2 = c^2 + 4$ and $2 = m + c$ $25m^2 = (2-m)^2 + 4$ or $25(2-c)^2 = c^2 + 4$ Uses the given hyperbola and the straight line with the result from (a) to obtain an equation in m or c		M1
	$24m^2 + 4m - 8 = 0$ or $24c^2 - 100c + 96 = 0$	Correct 3TQ in m or c	A1
	$24m^2 + 4m - 8 = 0 \Rightarrow m = \frac{1}{2}, -\frac{2}{3}$ Or $24c^2 - 100c + 96 = 0 \Rightarrow c = \frac{3}{2}, \frac{8}{3}$	Solves their 3TQ in m or c	M1
	$y = \frac{1}{2}x + \frac{3}{2}$ **or** $y = -\frac{2}{3}x + \frac{8}{3}$	One correct tangent	A1
	$y = \frac{1}{2}x + \frac{3}{2}$ **and** $y = -\frac{2}{3}x + \frac{8}{3}$	Both correct tangents	A1
			(5)
(c)	$m = \frac{1}{2},\ c = \frac{3}{2} \Rightarrow \frac{9}{4}x^2 + \frac{75}{2}x + \frac{625}{4} = 0 \Rightarrow x = ...$ **or** $m = -\frac{2}{3},\ c = \frac{8}{3} \Rightarrow \frac{64}{9}x^2 - \frac{800}{9}x + \frac{2500}{9} = 0 \Rightarrow x = ...$ Uses one of their m and c pairs and solves for x		M1
	$x = -\frac{25}{3}, y = -\frac{8}{3}$ **or** $x = \frac{25}{4}, y = -\frac{3}{2}$	One correct point	A1
	$x = -\frac{25}{3}, y = -\frac{8}{3}$ **and** $x = \frac{25}{4}, y = -\frac{3}{2}$	Both correct points	A1
			(3)
			Total 12