Q	Marking instructions	AO	Mark	Typical solution
9(a)	Demonstrates by substitution that $x=0$ or $y=0$ leads to value on the LHS = 0	2.4	E1	When $x = 0$ $0^2y^2 + 0y^4 = 0$ When $y = 0$ $x^2 0^2 + x0^4 = 0$ This is a contradiction because $x^2y^2 + xy^4 = 12$ so the curve does not intersect either axis
	Completes rigorous argument to show required result	2.1	R1	
9 (b)(i)	Uses implicit differentiation	3.1a	M1	$2xy^2 + 2x^2y\frac{dy}{dx} + y^4 + 4xy^3\frac{dy}{dx} = 0$ $\frac{dy}{dx} = -\frac{2xy^2+y^4}{2x^2y+4xy^3}$ $= -\frac{y\,(2xy+y^3)}{y(2x^2+4xy^2)}$ $= -\frac{2xy+y^3}{2x^2+4xy^2},$
	Product rule used LHS (at least one pair of terms correct)	1.1a	M1	
	Differentiates equation of curve fully correctly	1.1b	A1	
	Collects their $\frac{dy}{dx}$ terms in an equation and factorises	3.1a	M1	
	Completes convincing argument to obtain required result by **factorising** then simplifying y **AG**	2.1	R1	
9 (b)(ii)	Begins argument by setting $\frac{dy}{dx}=0$ to form an equation for x and y **PI** by $2xy+y^3=0$	2.1	M1	For stationary points $\frac{dy}{dx}=0$ $\Rightarrow 2xy+y^3=0$ $\Rightarrow y^2=-2x$ $\Rightarrow x^2y^2+x(-2x)y^2=12$ $\Rightarrow -x^2y^2=12$ Since $-x^2y^2<0$ there can be no stationary points.
	Obtains $y^2=-2x$ or $y=\sqrt{-2x}$ or $x = \frac{-y^2}{2}$	1.1b	A1	
	Substitutes $y^2=-2x$ or $x = \frac{-y^2}{2}$ into equation for curve	1.1a	M1	
	Completes convincing argument to deduce the required result	2.2a	R1	
9 (b)(iii)	Substitutes y = 1 into equation of curve to obtain correct quadratic **ACF**	3.1a	M1	$y=1 \Rightarrow x^2+x-12=0$ $\Rightarrow x=3 \qquad (x>0)$ $\Rightarrow \frac{dy}{dx} = -\frac{7}{30}$ $y-1=-\frac{7}{30}(x-3)$
	Deduces x = 3 **PI** by substituting their x in their dy/dx	2.2a	R1	
	Substitutes their x and y = 1 in their dy/dx	1.1a	M1	
	Obtains correct equation of tangent **ACF** **ISW**	1.1b	A1	
	Total		**15**	