Question	Scheme	Marks	AOs
8(a)	$\frac{\mathrm{d}}{\mathrm{d}x}\left(3y^2\right)=6y\frac{\mathrm{d}y}{\mathrm{d}x}$ or $\frac{\mathrm{d}}{\mathrm{d}x}\left(qxy\right)=qx\frac{\mathrm{d}y}{\mathrm{d}x}+qy$	M1	2.1
	$3px^2+qx\frac{\mathrm{d}y}{\mathrm{d}x}+qy+6y\frac{\mathrm{d}y}{\mathrm{d}x}=0$	A1	1.1b
	$\left(qx+6y\right)\frac{\mathrm{d}y}{\mathrm{d}x}=-3px^2-qy\Rightarrow\frac{\mathrm{d}y}{\mathrm{d}x}=...$	dM1	2.1
	$\frac{\mathrm{d}y}{\mathrm{d}x}=\frac{-3px^2-qy}{qx+6y}$	A1	1.1b
		(4)	
(b)	$p\left(-1\right)^3+q\left(-1\right)\left(-4\right)+3\left(-4\right)^2=26$	M1	1.1b
	$19x+26y+123=0\Rightarrow m=-\frac{19}{26}$	B1	2.2a
	$\frac{-3p\left(-1\right)^2-q\left(-4\right)}{q\left(-1\right)+6\left(-4\right)}=\frac{26}{19}$ or $\frac{q\left(-1\right)+6\left(-4\right)}{3p\left(-1\right)^2+q\left(-4\right)}=-\frac{19}{26}$	M1	3.1a
	$p-4q=22,\ 57p-102q=624\Rightarrow p=...,q=...$	dM1	1.1b
	$p=2,\ q=-5$	A1	1.1b
		(5)	
			(9 marks)

Notes

(a)

M1: For selecting the appropriate method of differentiating:

Allow this mark for either $3y^2\rightarrow\alpha y\frac{\mathrm{d}y}{\mathrm{d}x}$ or $qxy\rightarrow\alpha x\frac{\mathrm{d}y}{\mathrm{d}x}+\beta y$

A1: Fully correct differentiation. Ignore any spurious $\frac{\mathrm{d}y}{\mathrm{d}x}=...$

dM1: A valid attempt to make $\frac{\mathrm{d}y}{\mathrm{d}x}$ the subject with 2 terms only in $\frac{\mathrm{d}y}{\mathrm{d}x}$ coming from qxy and $3y^2$

Depends on the first method mark.

A1: Fully correct expression

(b)

M1: Uses $x = -1$ and $y = -4$ in the equation of C to obtain an equation in p and q

B1: Deduces the correct gradient of the given normal.

This may be implied by e.g.

$19x+26y+123=0\Rightarrow y=-\frac{19}{26}x+...\Rightarrow\text{Tangent equation is }y=\frac{26}{19}x+...$

M1: Fully correct strategy to establish an equation connecting p and q using $x = -1$ and $y = -4$ in their $\frac{\mathrm{d}y}{\mathrm{d}x}$ and the gradient of the normal. E.g. $(a)=-1\div\text{their}-\frac{19}{26}$ or $-1\div(a)=\text{their}-\frac{19}{26}$

dM1: Solves simultaneously to obtain values for p and q.

Depends on both previous method marks.

A1: Correct values

Note that in (b), attempts to form the equation of the normal in terms of *p* and *q* and then compare coefficients with 19*x* + 26*y* + 123 = 0 score no marks. If there is any doubt use Review.