Question Number	Scheme	Marks
5 (a)	$x^2+y^2-6x+5y-41=0$	
	Attempts $(x-3)^2+\left(y+\frac{5}{2}\right)^2=...$	M1
	Correct centre $\left(3,-\frac{5}{2}\right)$	A1
	Exact radius $\frac{15}{2}$	A1
		(3)
(b)	Sets up appropriate equation $(k+'3')^2+\left('\frac{5}{2}'\right)^2=\left(5+'\frac{15}{2}'\right)^2$	M1
	$(k+3)^2=150\Rightarrow k+3=\sqrt{150}$	dM1
	$\Rightarrow k=5\sqrt{6}-3$	A1
		(3)
		(6 marks)

(a)

M1: Attempts to complete the square for both variables. Look for $(x\pm3)^2,\left(y\pm\frac{5}{2}\right)^2=...$

This mark can be implied from the coordinates of the centre $\left[\left(3,-\frac{5}{2}\right)\right]$ just written down.

A1: $\left(3,-\frac{5}{2}\right)$

A1: $\frac{15}{2}$ condone $\sqrt{\frac{225}{4}}$ o.e which may be scored following $(x-3)^2+\left(y+\frac{5}{2}\right)^2=\frac{225}{4}$

(b)

M1: Uses Pythagoras' theorem to set up an equation in k

Look for $(k\pm'3')^2+\left('\frac{5}{2}'\right)^2=\left(5+'\frac{15}{2}'\right)^2$ following through on their $\left(3,-\frac{5}{2}\right)$ and $\frac{15}{2}$

Also look for $k^2+6k-141=0$ o.e.

dM1: Uses an appropriate method to proceed to a value for k

A1: $k=5\sqrt{6}-3$ o.e.

Question Number	Scheme	Marks
6 (i)	Can write p and/or q in an appropriate form. E.g $p=2n+1, q=2n+3$ $n\in\mathbb{N}$	B1
	$p^2-q^2=(2n+1)^2-(2n-1)^2$	M1
	$=4n^2+4n+1-(4n^2-4n+1)$	A1
	$=8n$ which is a multiple of 8, hence proven *	A1* **(4)**
(ii)	$y=x^3+12x^2+49x+2\Rightarrow\dfrac{\mathrm{d}y}{\mathrm{d}x}=3x^2+24x+49$	M1,
	$\Rightarrow\dfrac{\mathrm{d}y}{\mathrm{d}x}=3(x+4)^2+1$	dM1, A1
	Gradient is always $\geqslant 1$ so cannot ever be 0, so no stationary points on C *	A1* **(4)**
		(8 marks)

(i)

B1: Can write p and/or q in an appropriate form. Condone omission of $n\in\mathbb{N}$
Allow any letter to be used in place of n
Allow $(p=)\,2n+3, (q=)\,2n+1$ p and q to be implied

M1: Starts the proof by writing $\left[p^2-q^2=\right]\,(2n+1)^2-(2n-1)^2$ o.e

OR, such as $p^2-q^2=(2n+3)^2-(2n+1)^2$

NB Must be in one variable only and *p* and *q* must be consecutive.

A1: Correct multiplication to an intermediate or fully simplified answer,
Allow $4n^2+4n+1-(4n^2-4n+1)$

A1*: Reaches a correct answer, E.g. $8n$, gives a valid statement 'which is a multiple of 8' or a minimal conclusion. E.g., 'QED', 'Shown', □, #, etc.,

Note with $p^2-q^2=(2n+3)^2-(2n+1)^2$ you will get $8n+8$

SC Uses *p* < *q* Award marks as above, but score B1 M1 A1 A0 for an otherwise fully correct proof.