Question Number	Scheme	Marks
4.	$\int \left(\frac{12}{x^2}+4\right)\mathrm{d}x = -\frac{12}{x}+4x$ Sets $\int_k^{2k}\left(\frac{12}{x^2}+4\right)\mathrm{d}x = 14 \Rightarrow \left[-\frac{12}{x}+4x\right]_k^{2k} = 14$ $\left(-\frac{6}{k}+8k\right)-\left(-\frac{12}{k}+4k\right)=14 \Rightarrow 2k^2-7k+3=0$ o.e. $(2k-1)(k-3)=0 \Rightarrow k=\frac{1}{2},3$	M1 dM1, A1 ddM1, A1 **(5 marks)**

M1: Attempts to integrate with one index correct

dM1: Applies the limits either way around with a subtraction, **and** sets = 14

A1: Forms a correct 3TQ. Terms do not need to be on the same side of the = sign.

Look for $4k^2+6=14k$ o.e

ddM1: Uses any method of solving a 3TQ including a calculator.

A1: $k=\frac{1}{2},3$ following all previous marks.

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.