Question		Answer	Marks	AO	Guidance	
4	**(a)**	$(x-3)^2+(y+5)^2=-k+9+25$	**M1**	**3.1a**	Complete the square (for x and y) to obtain $(x\pm3)^2+(y\pm5)^2+...$	or for $...\pm k\pm3^2\pm5^2$
		$-k+34>0\Rightarrow k<34$	**A1**	**2.3**	cao – **www** allow equivalent in either set notation e.g. $\{k:k<34\}$ or interval notation e.g. $(-\infty,34)$ or $(-\infty,34]$ but not $[-\infty,34)$ or $[-\infty,34]$ unless $k<34$ already seen If implying a lower limit then **A0**	Allow $k\leqslant34$
			[2]			

Question		Answer	Marks	AO	Guidance	
4	(b)	$x^2+y^2-6x+10y-46=0$			For reference	
		$2x+2y\frac{dy}{dx}-6+10\frac{dy}{dx}(=0)$	**M1***	**3.1a**	Attempt to differentiate the equation for C implicitly – must be four terms including a $2y\frac{dy}{dx}$ term and two other terms correct (condone either –46 **or** k appearing in their deriv. as a 5th term) but if the derivative of $x^2+y^2-6x+10y-46=0$ is put equal to $\frac{1}{2}$ or $\frac{dy}{dx}$ (and used subsequently) then **M0**	**or** applying the chain rule to an expression of the form $\pm5\pm\sqrt{\lambda\pm(x\pm3)^2}$ for some non-zero λ, so must be of the form $\frac{1}{2}(f(x))^{-\frac{1}{2}}g(x)$ where f(x) is quadratic and g(x) is linear
		$\frac{dy}{dx}=\frac{6-2x}{2y+10}\Rightarrow\frac{3-x}{y+5}=\frac{1}{2}$	**M1dep***	**1.1**	Sets derivative equal to $\frac{1}{2}$	**or** substitutes $\frac{1}{2}$ for $\frac{dy}{dx}$
		$2x+y=1$ $\Rightarrow x^2+(1-2x)^2-6x+10(1-2x)-46\,(=0)$	**M1**	**2.1**	Substitutes their linear expression into the given equation of C with $k=-46$ (must be five terms with two quadratic terms and two linear terms in x oe if using completing the square form from **(a)**) to obtain an expression/equation in x (or y) **only**	**Dependent on first two M marks –** if chain rule used this mark is implied by setting $\frac{dy}{dx}$ equal to $\frac{1}{2}$
		$5x^2-30x-35\,(=0)$	**M1**	**1.1**	Simplify to a 3TQ in x (or y) (allow sign errors **only** when simplifying from **their** five term equation/expression **or** completing the square equation/expression)	**Dependent on all M marks** For y if correct: $y^2+10y-39(=0)$
		$(7,-13),(-1,3)$	**A1**	**2.2a**	**BC -** do not need to be stated as coordinates	**Two values of x and y only**

Question		Answer	Marks	AO	Guidance	
			[5]			