| Question | Scheme | Marks | AOs |
|---|---|---|---|
| **6 (a)** | $x^2+y^2-6x+10y+k=0$ | | |
| | $(x-3)^2+(y+5)^2 \pm ... = ...$ | M1 | 1.1b |
| | Centre $(3,-5)$ | A1 | 1.1b |
| | | **(2)** | |
| **(b)** | Deduces that $k=9$ is a critical point | B1ft | 2.2a |
| | Recognises that radius > 0<br>$"9"+"25"-k>0$ | M1 | 3.1a |
| | $9<k<34$ | A1 | 1.1b |
| | | **(3)** | |
| | | | **(5 marks)** |

**Notes:**

**(a)**

**M1:** For sight of $(x\pm3)^2 \pm (y\pm5)^2 \pm ... = ...$ or one coordinate for centre from $(\pm3,\pm5)$

**A1:** Centre $(3,-5)$

**(b)**

**B1ft:** Deduces that $k…9$ is a critical point. Allow this to come from their $("5")^2$ Condone $\frac{36}{4}$

Note that this might come from setting $y = 0$ and using the discriminant on $x^2-6x+k=0$

**M1:** $(x\pm3)^2+(y\pm5)^2=("3")^2+("5")^2-k$ **and** recognises that the radius$^2$ must be positive so $("3")^2+("5")^2-k>0$ but condone $("3")^2+("5")^2-k\ …0$

$k<34$ **or** $k\ ,,\ 34$ would imply this method mark.

Note: they may have incorrectly calculated $("3")^2+("5")^2$ in (a) so allow their value for this in place of $("3")^2+("5")^2$ as long as the intention is clear.

**A1:** $9<k<34$ but condone $9<k\ ,,\ 34$. Allow inequalities to be separate, i.e., $k>9, k<34$

Set notation may be seen $\{k:k>9\}\cap\{k:k<34\}$ **or** $k\in(9,34)$

Condone $\{k:k>9\}\cap\{k:k\ ,,\ 34\}$ **or** $k\in(9,34]$ **or** $k>9$ and $k\ ,,\ 34$

Must not be combined incorrectly, e.g., $\{k:k>9\}\cup\{k:k<34\}$