16 (a)

$P(4, k)$

$C(1, -2)$

$$d = \sqrt{(4-1)^2 + (k-(-2))^2}$$

$$= \sqrt{3^2 + (k+2)^2}$$

$$= \sqrt{9 + k^2 + 4k + 4}$$

$$= \sqrt{k^2 + 4k + 13}$$

(b) radius = 5

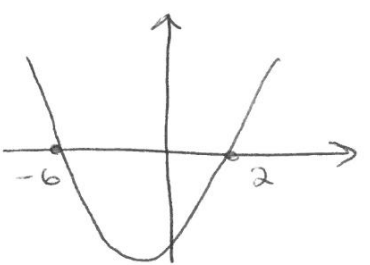
$$\sqrt{k^2+4k+13} > 5$$

$$k^2+4k+13 > 25$$

$$k^2+4k-12 > 0$$

$(k+6)(k-2)$

$k=-6 \quad k=2$



$$k^2+4k-12>0$$

when $k<-6, \; k>2$

Question			Generic scheme	Illustrative scheme	Max mark
16.	(a)		$\bullet^1$ identify centre $\bullet^2$ apply distance formula and demonstrate result	$\bullet^1$ (1, −2) stated or implied by $\bullet^2$ $\bullet^2$ $\sqrt{(4-1)^2+(k-(-2))^2}$ leading to $\sqrt{k^2+4k+13}$	**2**
Notes:					
1. Beware of candidates who 'fudge' their working between $\bullet^1$ and $\bullet^2$.					
Commonly Observed Responses:					
	(b)		$\bullet^3$ interpret information $\bullet^4$ express inequality in standard quadratic form $\bullet^5$ determine zeros of quadratic expression $\bullet^6$ state range with justification	$\bullet^3$ $\sqrt{k^2+4k+13}>5$ $\bullet^4$ $k^2+4k-12>0$ $\bullet^5$ −6, 2 $\bullet^6$ $k<-6, k>2$ with eg sketch or table of signs	**4**
Notes:					
2. Where a candidate has used an incorrect expression from part (a), $\bullet^3$ is not available. However, $\bullet^4$, $\bullet^5$ and $\bullet^6$ are still available for dealing with an expression of equivalent difficulty. 3. Candidates who do not work with an inequation from the outset lose $\bullet^3$, $\bullet^4$ and $\bullet^6$. However, $\bullet^5$ is still available. See Candidate A.					
Commonly Observed Responses:					
Candidate A $\sqrt{k^2+4k+13}=5$ $\bullet^3$ ✗ $k^2+4k-12=0$ $\bullet^4$ ✗ $k=-6,\ k=2$ $\bullet^5$ ✓ For P to lie outside the circle $k<-6,\ k>2$ $\bullet^6$ ✗					