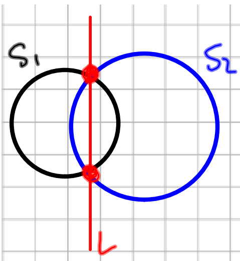
11. Find the equation of the common chord of the circles S_1 $x^2 + y^2 - 3x + 5y - 4 = 0$ and S_2 $x^2 + y^2 - x + 4y - 7 = 0$.
Hence find the coordinates of the points of intersection of the two circles.



$S_1 \cap L$?

1. rewrite linear
2. Sub into circle & solve
3. Sub ans into equ. (1)

$$x^2 + y^2 - 3x + 5y - 4 = 0$$
$$\mp x^2 \mp y^2 \pm x \mp 4y \pm 7 = 0$$
$$-2x + y + 3 = 0$$

L: $\boxed{2x - y - 3 = 0}$

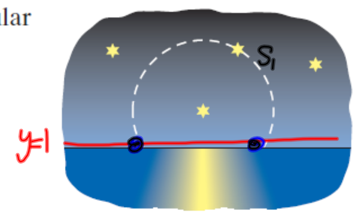
$\Rightarrow \quad y = 2x - 3$ (1)

(2)
$$x^2 + (2x-3)^2 - 3x + 5(2x-3) - 4 = 0$$
$$x^2 + 4x^2 - 12x + 9 - 3x + 10x - 15 - 4 = 0$$
$$5x^2 - 5x - 10 = 0$$
$$x^2 - x - 2 = 0$$
$$(x+1)(x-2) = 0$$
$$x = -1 \quad \text{or} \quad x = 2$$

(3)
$y = 2(-1) - 3 = -2 - 3 = -5$ pt $(-1, -5)$

$y = 2(2) - 3 = 4 - 3 = 1$ pt $(2, 1)$

14. Stars revolve around the Pole Star once each night. A particular star traces out the circle, $x^2 + y^2 + 2x - 8y + 4 = 0$, in a chosen set of coordinate axes.
The horizon has equation $y = 1$.
(i) State the coordinates of the Pole Star.
(ii) Calculate the coordinates of the points of rising and setting of the moving star.



$c(-g, -f)$

$r = \sqrt{g^2 + f^2 - c}$

$S: x^2 + y^2 + 2x - 8y + 4 = 0$

Centre $(-1, 4)$ = pole star coordinates

$r = \sqrt{1^2 + 4^2 - 4} = \sqrt{13} = r$

$y = 1 \Rightarrow$
$$x^2 + (1)^2 + 2x - 8(1) + 4 = 0$$
$$x^2 + 1 + 2x - 8 + 4 = 0$$
$$x^2 + 2x - 3 = 0$$
$$(x+3)(x-1)$$
$$x = -3, \quad x = 1$$

pt $(-3, 1)$ & pt $(1, 1)$