Find the intersection points, if any, for each system of equations.

{x^2 + y^2 - 16y + 39 = 0
{y^2 – x^2 – 9 = 0

Solution:

$\begin{cases} x^2 + y^2 - 16y + 39 = 0 \\ y^2 - x^2 - 9 = 0 \end{cases} => x^2 + y^2 - 16y + 39 = y^2 - x^2 - 9 =>$
$2x^2 - 16y + 49 = 0 => x^2 - 8y + 24 = 0$

Then, we solve this equation and get $x = \pm\sqrt{8(y-3)}$,

$y^2 - (8y - 24) - 9 = 0 => y^2 - 8y + 15 = 0 => y_1 = \frac{8+2}{2} = 5, y_2 = \frac{8-2}{2} = 3$

Then we put y_1, y_2 to $x = \pm\sqrt{8(y-3)}$, so we get

$y_1 = 5 => x_{11} = 4, x_{12} = -4$

$y2 = 3 => x_2 = 0$

Answer

Intersection points are (0,3), (4,5), (-4,5)