Guide to:
Quad. sim. equations

maths Links

Explanation:

To solve simultaneous equations where one equation is linear and the other is quadratic (such as a circle $x^2 + y^2 = r^2$ or parabola), always use **substitution**: rearrange the linear equation to make x or y the subject, then substitute this expression into the quadratic equation.

Expand the brackets carefully, rearrange into standard quadratic form $\mathbf{ax^2 + bx + c = 0}$, and solve by factorising or the quadratic formula. Finally, substitute each root back into the **linear equation** and pair up your (x, y) coordinates clearly.

Example 1: Solve $y = x^2 - 3x + 4$ and $y = 2x - 2$.

Solution:

Equate y: $x^2 - 3x + 4 = 2x - 2$

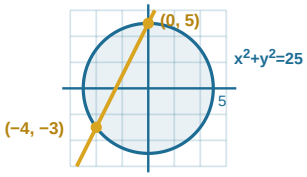
Rearrange to 0: $x^2 - 5x + 6 = 0 \Rightarrow (x - 2)(x - 3) = 0$

So **x = 2** or **x = 3**

In $y = 2x - 2$: when x = 2, y = 2; when x = 3, y = 4

Answer: (2, 2) and (3, 4)

Example 2: Solve $x^2 + y^2 = 25$ and $y - 2x = 5$.



Solution:

Substitute **y = 2x + 5** into $x^2 + y^2 = 25$:

$x^2 + (2x + 5)^2 = 25 \Rightarrow 5x^2 + 20x = 0$

$5x(x + 4) = 0 \Rightarrow$ **x = 0** (y = 5) or **x = −4** (y = −3)

Answer: (0, 5) and (−4, −3)

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