

Intersection: Line & Circle

Find the points of intersection of the graphs for the following equations:

$$x^2 + y^2 = 20 \quad \text{and} \quad y = 2x + 6$$

$$x = -\frac{4}{5} \quad \text{or} \quad x = -4$$

$$\therefore y = 2\left(-\frac{4}{5}\right) + 6 \quad \therefore y = 2(-4) + 6$$

$$= \frac{22}{5} \quad = -2$$

$$\therefore \left(-\frac{4}{5}, \frac{22}{5}\right) \quad \therefore (-4, -2)$$

is a point of intersection.

is a point of intersection.

Quadratic Formula

$$ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Description

Students are given the equation of a line and the equation of a circle (in gradient-intercept and general form respectively), and are asked to find the points of intersection.

Teaching Hints

Some students may struggle to see why substituting an equation into another will yield the points of intersection. Explain that by doing this we limit what values x can take. It can now only take values where both equations are satisfied.

Activities

Easy

Find the points of intersection of the graphs for the following equations:

$$x^2 + y^2 = 200 \quad y = -x$$

$$(10, 10), (-10, -10)$$

$$(11, -9), (-9, 11)$$

$$(11, 9), (-9, -11)$$

$$(10, -10), (-10, 10) \quad \checkmark$$

Medium

Find the points of intersection of the graphs for the following equations:

$$x^2 + y^2 = 3,185 \quad y = 8x$$

$$(7, -56), (-7, 56)$$

$$(8, 57), (-6, -55)$$

$$(7, 56), (-7, -56) \quad \checkmark$$

$$(8, -57), (-6, 55)$$

Hard

Find the points of intersection of the graphs for the following equations:

$$x^2 + y^2 = 20 \quad y = 2x + 6$$

$$\left(-\frac{4}{5}, \frac{42}{5}\right), (-4, -7)$$

$$\left(\frac{4}{5}, \frac{22}{5}\right), (-4, -2) \quad \checkmark$$

$$(-1, -1), \left(-\frac{9}{5}, \frac{2}{5}\right)$$

$$(-1, -4), \left(-\frac{9}{5}, \frac{7}{5}\right)$$