6.3) Intersections of straight lines and circles

Worked example

Find the coordinates of the points where the line $y = x + 4$ meets the circle $x^2 + (y - 3)^2 = 61$

Your turn

Find the coordinates of the points where the line $y = x + 5$ meets the circle $x^2 + (y - 2)^2 = 29$

$(-5, 0)$ and $(2, 7)$

Worked example

Show that the line $y = x + 4$ does not meet the circle $(x - 3)^2 + y^2 = 22$

Your turn

Show that the line $y = x - 7$ does not meet the circle $(x + 2)^2 + y^2 = 33$

Shown using discriminant.

Worked example

The line with equation $y = kx$ intersects the circle with equation $x^2 - 8x + y^2 + 12y + 32 = 0$ at two distinct points.
Find the range of possible values of k to 2 dp

Your turn

The line with equation $y = kx$ intersects the circle with equation $x^2 - 4x + y^2 + 10y + 23 = 0$ at two distinct points.
Find the range of possible values of k to 2 dp

$k = -0.87, k = 10.87$ (2 dp)

Worked example

Using an algebraic method, determine k such that the line $y = x + k$ touches the circle with equation $x^2 + y^2 = 9$

Your turn

Using an algebraic method, determine k such that the line $y = x + k$ touches the circle with equation $x^2 + y^2 = 1$

$k = \pm\sqrt{2}$

Worked example

The line with equation $y = 5x + 2$ meets the circle with equation $x^2 + kx + y^2 = 6$ at exactly one point. Find the two possible values of k

Your turn

The line with equation $y = 4x + 3$ meets the circle with equation $x^2 + kx + y^2 = 7$ at exactly one point. Find the two possible values of k

$$k = -24 \pm 4\sqrt{6}$$

Worked example

The line with equation $y = 4x - 3$ does not intersect the circle with equation $x^2 + 2x + y^2 = k$.

Find the range of possible values of k.

Your turn

The line with equation $y = 3x - 2$ does not intersect the circle with equation $x^2 + 4x + y^2 = k$.

Find the range of possible values of k.

$$k < \frac{12}{5}$$