The circle C has the equation $x^2 + y^2 + 2x - 14y + 30 = 0$.

a Find the coordinates of the centre of C. **(2)**

b Find the radius of C, giving your answer in the form $k\sqrt{5}$. **(2)**

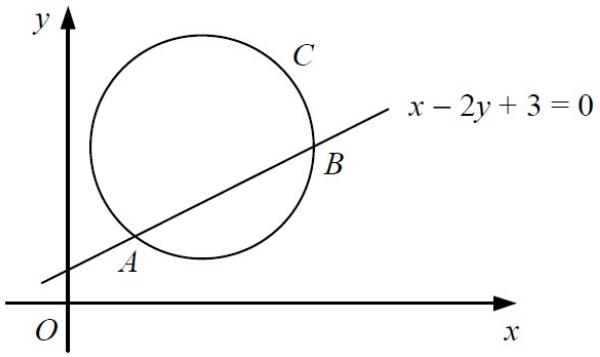
c Show that the line $y = 2x - 1$ is a tangent to C and find the coordinates of the point of contact. **(4)**

The circle C has equation $x^2 + y^2 - 6x - 12y + 28 = 0$.

a Find the coordinates of the centre of C. **(2)**

The line $y = x - 2$ intersects C at the points A and B.

b Find the length AB in the form $k\sqrt{2}$. **(6)**



The line with equation $x - 2y + 3 = 0$ intersects the circle C at the points A and B as shown in the diagram above. Given that the centre of C has coordinates (6, 7),

a find the coordinates of the mid-point of the chord AB. **(6)**

Given also that the x-coordinate of the point A is 3,

b find the coordinates of the point B, **(3)**

c find an equation for C. **(2)**

The circle C has equation $x^2 + y^2 - 4x - 6 = 0$ and the line l has equation $y = 3x - 6$.

a Show that l passes through the centre of C. **(3)**

b Find an equation for each tangent to C that is parallel to l. **(6)**

Find in each case the coordinates of the points where the line l intersects the circle C.

a $l : y = x - 4$ $\quad C : x^2 + y^2 = 10$

b $l : 3x + y = 17$ $\quad C : x^2 + y^2 - 4x - 2y - 15 = 0$

c $l : y = 2x + 2$ $\quad C : 4x^2 + 4y^2 + 4x - 8y - 15 = 0$

The line with equation $y = 1 - x$ intersects the circle with equation $x^2 + y^2 + 6x + 2y = 27$ at the points A and B.

Find the length of the chord AB, giving your answer in the form $k\sqrt{2}$.

The line with equation $2x + 3y = k$ is a tangent to the circle with equation $x^2 + y^2 + 6x + 4y = 0$.
Find the two possible values of k.

Solve the simultaneous equations

$$x + 2y = 3$$
$$x^2 + y^2 - 2xy = 6$$

A circle C has radius $\sqrt{5}$ and has its centre at the point with coordinates (4, 3).

(a) Prove that an equation of the circle C is $x^2 + y^2 - 8x - 6y + 20 = 0$.

(3)

The line l, with equation $y = 2x$, is a tangent to the circle C.

(b) Find the coordinates of the point where the line l touches C.

(4)

Two circles C_1 and have equations

$$(x-2)^2 + y^2 = 9 \text{ and } (x-5)^2 + y^2 = 9$$

respectively.

(a) For each of these circles state the radius and the coordinates of the centre.

(3)

(b) Sketch the circles C_1 and on the same diagram.

(3)

(c) Find the exact distance between the points of intersection of C_1 and

(3)

A circle C has equation

$$x^2 + y^2 - 6x + 8y - 75 = 0.$$

(a) Write down the coordinates of the centre of C, and calculate the radius of C.

(3)

A second circle has centre at the point (15, 12) and radius 10.

(b) Sketch both circles on a single diagram and find the coordinates of the point where they touch.

(4)

Solve the simultaneous equations

$$x + y = 3$$
$$x^2 + 2y^2 - 8x = 6$$