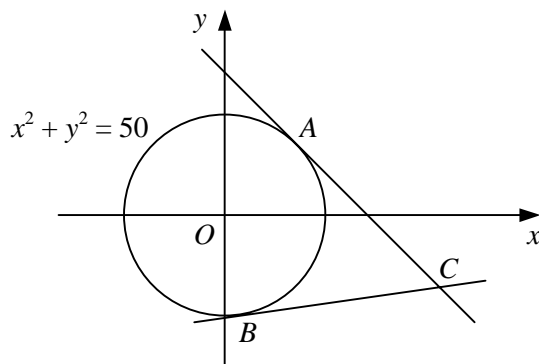


- 1 A circle has the equation  $x^2 + y^2 - 8x + 7 = 0$ .
- a Find the coordinates of the centre of the circle. (2)
- b Find the radius of the circle. (2)
- 2 A circle has the equation  $x^2 + y^2 - 6x + 2y - 15 = 0$ .
- a Find the coordinates of the centre of the circle. (2)
- b Find the radius of the circle. (1)
- c Show that the tangent to the circle at the point  $(7, 2)$  has equation  $4x + 3y - 34 = 0$ . (4)
- 3 A circle has the equation  $x^2 + y^2 + 6x - 8y + 21 = 0$ .
- a Find the coordinates of the centre and the radius of the circle. (3)
- The point  $P$  lies on the circle.
- b Find the greatest distance of  $P$  from the origin. (2)

4

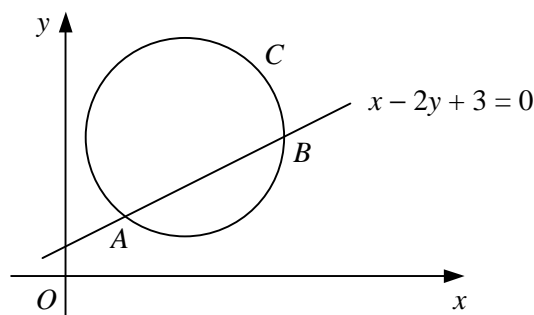


The diagram shows the circle with equation  $x^2 + y^2 = 50$  and the tangents to the circle at the points  $A(5, 5)$  and  $B(1, -7)$ .

- a Find an equation of the tangent to the circle at  $A$ . (3)
- b Show that the tangent to the circle at  $B$  has the equation  $x - 7y - 50 = 0$ . (3)
- c Find the coordinates of the point  $C$  where the tangents to the circle at  $A$  and  $B$  intersect. (2)
- 5 Circle  $C_1$  has the equation  $x^2 + y^2 - 2ay = 0$ , where  $a$  is a positive constant.
- a Find the coordinates of the centre and the radius of  $C_1$ . (4)
- Circle  $C_2$  has the equation  $x^2 + y^2 - 2bx = 0$ , where  $b$  is a constant and  $b > a$ .
- b Sketch  $C_1$  and  $C_2$  on the same diagram. (4)
- 6 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)

- 7 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)
- 8 The circle  $C$  has centre  $(8, -1)$  and passes through the point  $(4, 1)$ .
- a Find an equation for  $C$ . (3)
- b Show that the line with equation  $x + 2y + 4 = 0$  is a tangent to  $C$ . (3)
- 9 The points  $P(-10, 2)$ ,  $Q(8, 14)$  and  $R(-2, -10)$  all lie on circle  $C$ .
- a Show that  $PR$  is perpendicular to  $PQ$ . (2)
- b Hence, show that  $C$  has the equation  $x^2 + y^2 - 6x - 4y - 156 = 0$ . (5)
- 10 A circle has the equation  $x^2 + y^2 - 2x - 7y - 16 = 0$ .
- a Find the coordinates of the centre of the circle. (2)
- b Show that the radius of the circle is  $k\sqrt{13}$ , where  $k$  is an exact fraction to be found. (2)
- c Find an equation of the tangent to the circle at the point  $(4, 8)$ , giving your answer in the form  $ax + by + c = 0$ , where  $a$ ,  $b$  and  $c$  are integers. (4)

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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)
- 12 The circle  $C$  has equation  $x^2 + y^2 - 8x - 16y + 72 = 0$ .
- a Find the coordinates of the centre and the radius of  $C$ . (3)
- b Find the distance of the centre of  $C$  from the origin in the form  $k\sqrt{5}$ . (2)
- The point  $A$  lies on  $C$  and the tangent to  $C$  at  $A$  passes through the origin  $O$ .
- c Show that  $OA = 6\sqrt{2}$ . (3)
- 13 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)