

Coordinate Geometry – Circles - 2

1.

The points A and B have coordinates $(5, -1)$ and $(13, 11)$ respectively.

(a) Find the coordinates of the mid-point of AB .

(2)

Given that AB is a diameter of the circle C ,

(b) find an equation for C .

(4)

2.

The circle C , with centre at the point A , has equation $x^2 + y^2 - 10x + 9 = 0$.

Find

(a) the coordinates of A ,

(2)

(b) the radius of C ,

(2)

(c) the coordinates of the points at which C crosses the x -axis.

(2)

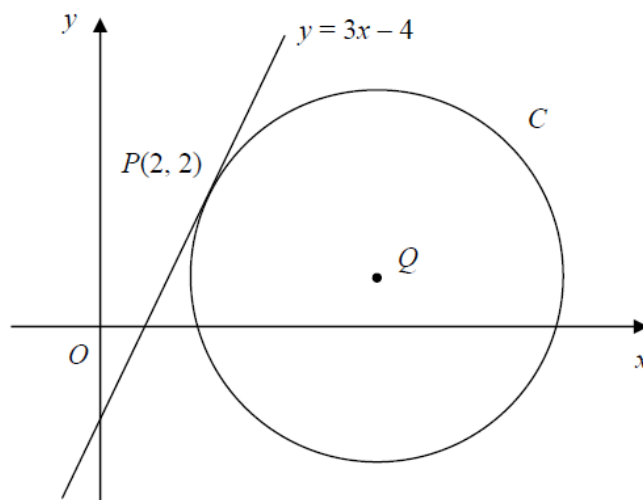
Given that the line l with gradient $\frac{7}{2}$ is a tangent to C , and that l touches C at the point T ,

(d) find an equation of the line which passes through A and T .

(3)

3.

Figure 1



The line $y = 3x - 4$ is a tangent to the circle C , touching C at the point $P(2, 2)$, as shown in Figure 1.

The point Q is the centre of C .

(a) Find an equation of the straight line through P and Q . (3)

Given that Q lies on the line $y = 1$,

(b) show that the x -coordinate of Q is 5, (1)

(c) find an equation for C . (4)

4.

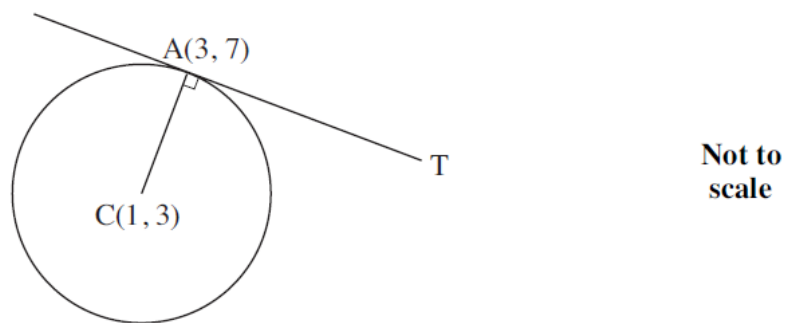


Fig. 11

A circle has centre $C(1, 3)$ and passes through the point $A(3, 7)$ as shown in Fig. 11.

(i) Show that the equation of the tangent at A is $x + 2y = 17$. [4]

(ii) The line with equation $y = 2x - 9$ intersects this tangent at the point T .

Find the coordinates of T . [3]

(iii) The equation of the circle is $(x - 1)^2 + (y - 3)^2 = 20$.

Show that the line with equation $y = 2x - 9$ is a tangent to the circle. Give the coordinates of the point where this tangent touches the circle. [5]

5.

A circle with centre C has equation $x^2 + y^2 - 10x + 12y + 41 = 0$. The point $A(3, -2)$ lies on the circle.

(a) Express the equation of the circle in the form

$$(x - a)^2 + (y - b)^2 = k$$

[3 marks]

(b) (i) Write down the coordinates of C .

[1 mark]

(ii) Show that the circle has radius $n\sqrt{5}$, where n is an integer.

[2 marks]

(c) Find the equation of the tangent to the circle at the point A , giving your answer in the form $x + py = q$, where p and q are integers.

[5 marks]

(d) The point B lies on the tangent to the circle at A and the length of BC is 6. Find the length of AB .

[3 marks]

6.

The points D , E and F have coordinates $(-2, 0)$, $(0, -1)$ and $(2, 3)$ respectively.

(i) Calculate the gradient of DE . [1]

(ii) Find the equation of the line through F , parallel to DE , giving your answer in the form $ax + by + c = 0$. [3]

(iii) By calculating the gradient of EF , show that DEF is a right-angled triangle. [2]

(iv) Calculate the length of DF . [2]

(v) Use the results of parts (iii) and (iv) to show that the circle which passes through D , E and F has equation $x^2 + y^2 - 3y - 4 = 0$. [5]
