

# P2 Chapter 2

# Coordinate

# Geometry

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10.

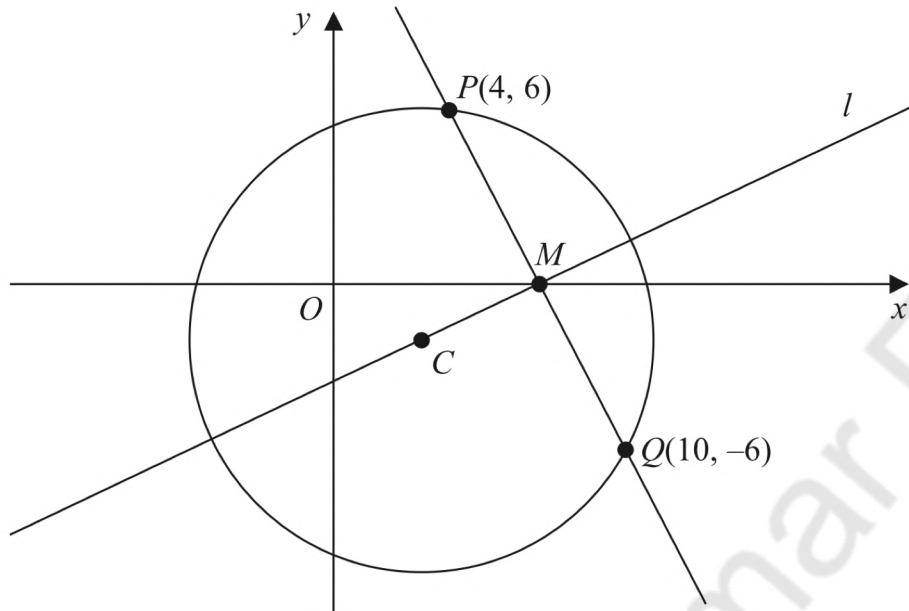


Figure 3

Figure 3 shows a circle with centre  $C$ .

The point  $P(4, 6)$  and the point  $Q(10, -6)$  both lie on the circumference of the circle.

The point  $M$  is the midpoint of  $PQ$ .

The line  $l$  passes through  $C$  and  $M$ .

- (a) Find an equation for  $l$ , giving your answer in the form  $px + qy + r = 0$ , where  $p$ ,  $q$  and  $r$  are integers to be found. (4)

Given that the  $y$  coordinate of  $C$  is  $-2$

- (b) find an equation for the circle. (4)

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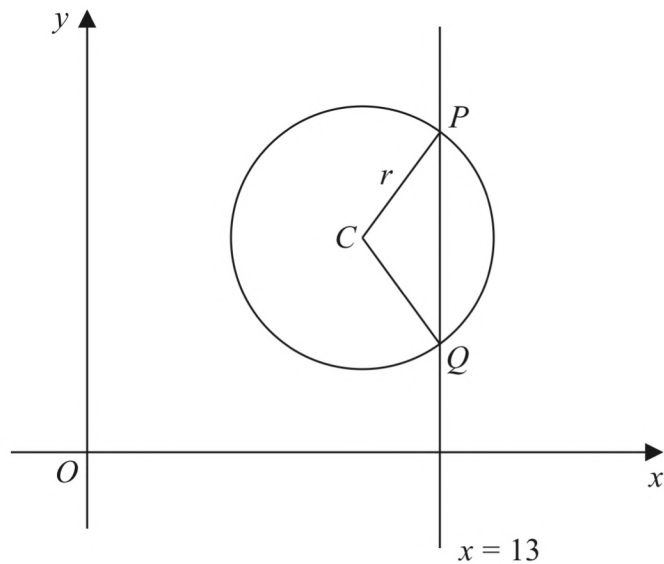


Figure 1

The circle with equation

$$x^2 + y^2 - 20x - 16y + 139 = 0$$

had centre  $C$  and radius  $r$ .

(a) Find the coordinates of  $C$ .

(2)

(b) Show that  $r = 5$

(2)

The line with equation  $x = 13$  crosses the circle at the points  $P$  and  $Q$  as shown in Figure 1.

(c) Find the  $y$  coordinate of  $P$  and the  $y$  coordinate of  $Q$ .

(3)

A tangent to the circle from  $O$  touches the circle at point  $X$ .

(d) Find, in surd form, the length  $OX$ .

(3)

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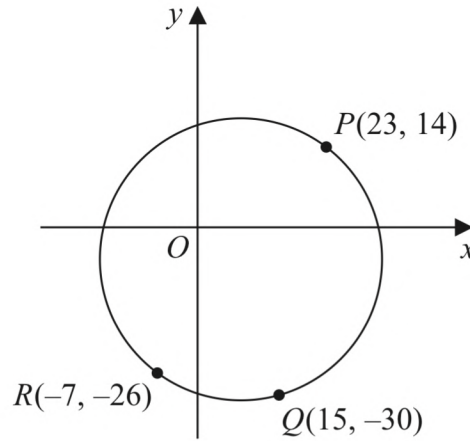


Figure 1

The points  $P(23, 14)$ ,  $Q(15, -30)$  and  $R(-7, -26)$  lie on the circle  $C$ , as shown in Figure 1.

(a) Show that angle  $PQR = 90^\circ$  (2)

(b) Hence, or otherwise, find  
 (i) the centre of  $C$ ,  
 (ii) the radius of  $C$ . (3)

Given that the point  $S$  lies on  $C$  such that the distance  $QS$  is greatest,

(c) find an equation of the tangent to  $C$  at  $S$ , giving your answer in the form  $ax + by + c = 0$ , where  $a$ ,  $b$  and  $c$  are integers to be found. (3)

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10. The circle  $C$  has centre  $X(3, 5)$  and radius  $r$

The line  $l$  has equation  $y = 2x + k$ , where  $k$  is a constant.

(a) Show that  $l$  and  $C$  intersect when

$$5x^2 + (4k - 26)x + k^2 - 10k + 34 - r^2 = 0$$

(3)

Given that  $l$  is a tangent to  $C$ ,

(b) show that  $5r^2 = (k + p)^2$ , where  $p$  is a constant to be found.

(3)

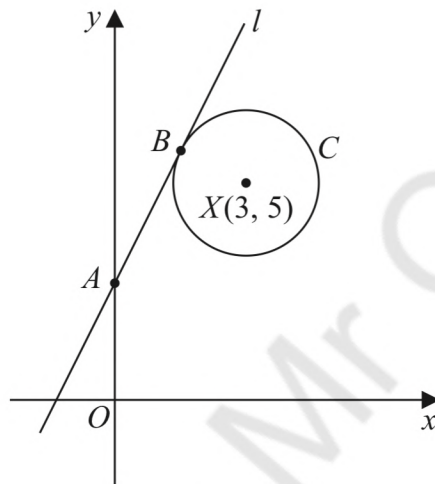


Figure 2

The line  $l$

- cuts the  $y$ -axis at the point  $A$
- touches the circle  $C$  at the point  $B$

as shown in Figure 2.

Given that  $AB = 2r$

(c) find the value of  $k$

(6)

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9. In this question you must show detailed reasoning.

Solutions relying entirely on calculator technology are not acceptable.

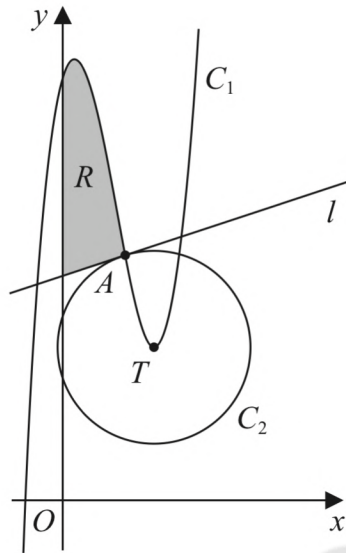


Figure 3

Figure 3 shows

- the curve  $C_1$  with equation  $y = x^3 - 5x^2 + 3x + 14$
- the circle  $C_2$  with centre  $T$

The point  $T$  is the minimum turning point of  $C_1$

Using Figure 3 and calculus,

- (a) find the coordinates of  $T$  (3)

The curve  $C_1$  intersects the circle  $C_2$  at the point  $A$  with  $x$  coordinate 2

- (b) Find an equation of the circle  $C_2$  (3)

The line  $l$  shown in Figure 3, is the tangent to circle  $C_2$  at  $A$

- (c) Show that an equation of  $l$  is

$$y = \frac{1}{3}x + \frac{22}{3} \quad (3)$$

The region  $R$ , shown shaded in Figure 3, is bounded by  $C_1$ ,  $l$  and the  $y$ -axis.

- (d) Find the exact area of  $R$ . (3)

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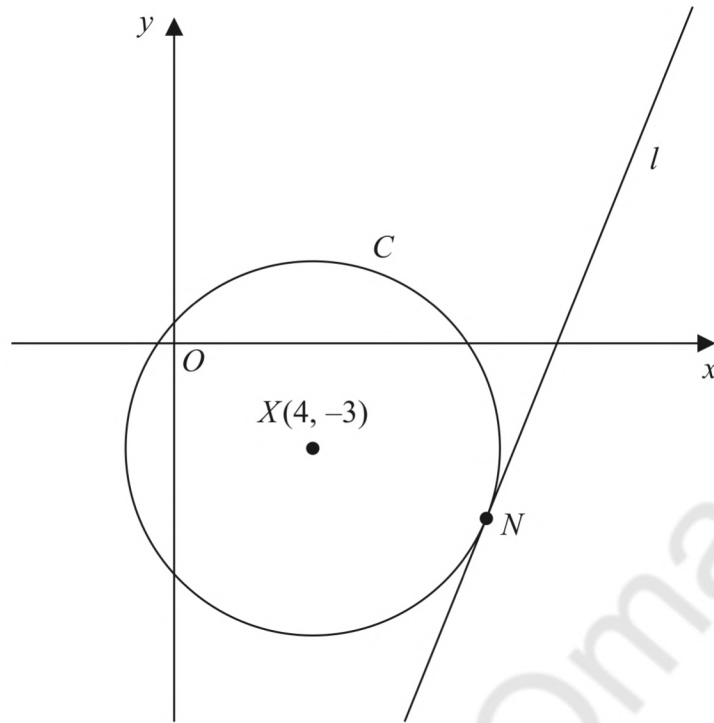


Figure 2

Figure 2 shows a sketch of

- the circle  $C$  with centre  $X(4, -3)$
- the line  $l$  with equation  $y = \frac{5}{2}x - \frac{55}{2}$

Given that  $l$  is the tangent to  $C$  at the point  $N$ ,

(a) show that an equation for the straight line passing through  $X$  and  $N$  is

$$2x + 5y + 7 = 0 \tag{3}$$

(b) Hence find

- (i) the coordinates of  $N$ ,
- (ii) an equation for  $C$ .

(5)

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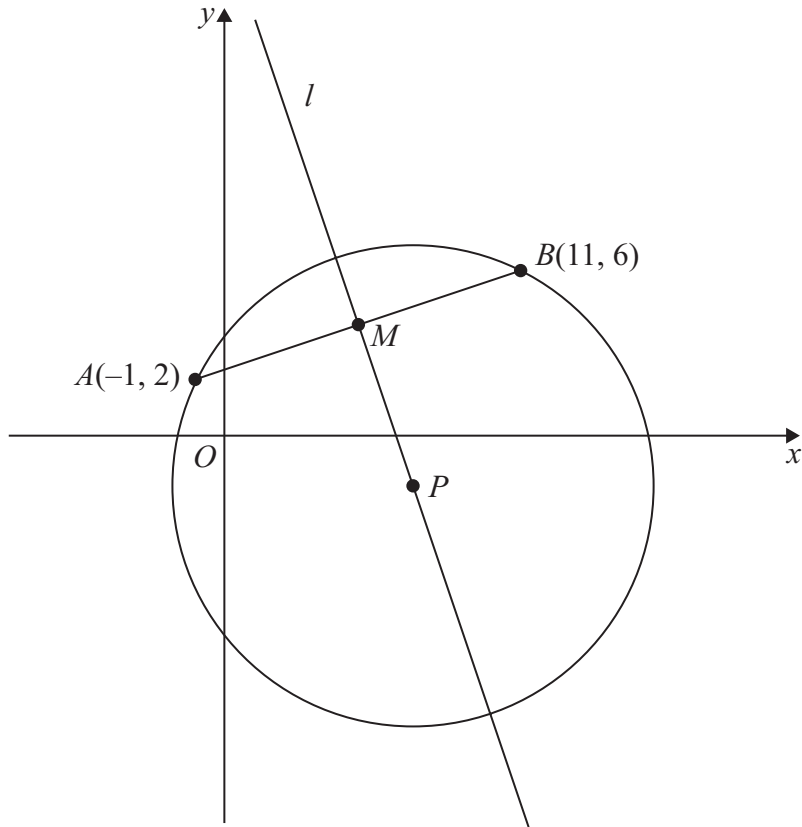








6.



**Figure 2**

The point  $A(-1, 2)$  and the point  $B(11, 6)$  both lie on a circle with centre  $P$ .

The point  $M$  is the midpoint of  $AB$ .

Given that the line  $l$  passes through  $M$  and  $P$ , as shown in Figure 2,

- (a) find an equation for  $l$ , giving your answer in the form  $y = mx + c$ , where  $m$  and  $c$  are constants. (4)

Given that  $P$  has coordinates  $(7, k)$ , where  $k$  is a constant,

- (b) find the value of  $k$ , (1)

- (c) find an equation for the circle. (3)

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