

Higher Mathematics

Circle - Questions - 2013-2017

Marks are indicated in brackets after each question number

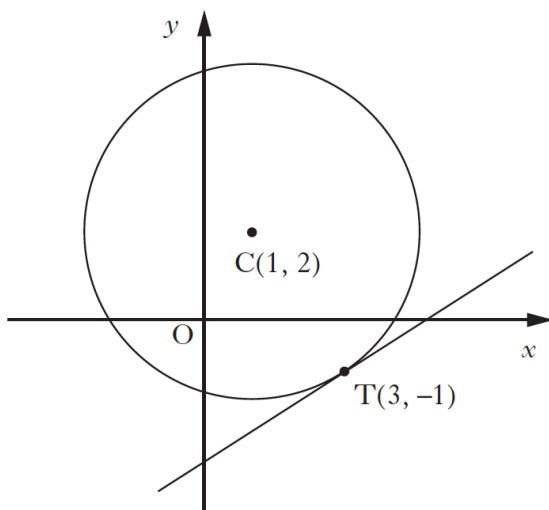
2013 Paper 1 Question 22, (2) (3) (3) (4)

A circle C_1 has equation $x^2 + y^2 + 2x + 4y - 27 = 0$.

- (a) Write down the centre and calculate the radius of C_1 .
- (b) The point $P(3, 2)$ lies on the circle C_1 .
Find the equation of the tangent at P .
- (c) A second circle C_2 has centre $(10, -1)$. The radius of C_2 is half of the radius of C_1 .
Show that the equation of C_2 is $x^2 + y^2 - 20x + 2y + 93 = 0$.
- (d) Show that the tangent found in part (b) is also a tangent to circle C_2 .

2014 Paper 1 Question 2, (2)

The diagram shows a circle with centre $C(1, 2)$ and the tangent at $T(3, -1)$.



What is the gradient of this tangent?

2014 Paper 1 Question 23, (4) (3) (3)

- (a) Find P and Q, the points of intersection of the line $y = 3x - 5$ and the circle C_1 with equation $x^2 + y^2 + 2x - 4y - 15 = 0$.
- (b) T is the centre of C_1 .
Show that PT and QT are perpendicular.
- (c) A second circle C_2 passes through P, Q and T.
Find the equation of C_2 .

2014 Paper 2 Question 8, (5)

Given that the equation

$$x^2 + y^2 - 2px - 4py + 3p + 2 = 0$$

represents a circle, determine the range of values of p .

2015 Paper 1 Question 11, (4) (6)

T(-2, -5) lies on the circumference of the circle with equation

$$(x + 8)^2 + (y + 2)^2 = 45.$$

- (a) Find the equation of the tangent to the circle passing through T.
- (b) This tangent is also a tangent to a parabola with equation $y = -2x^2 + px + 1 - p$, where $p > 3$.
Determine the value of p .

2015 Paper 1 Question 14, (2)

The circle with equation $x^2 + y^2 - 12x - 10y + k = 0$ meets the coordinate axes at exactly three points.

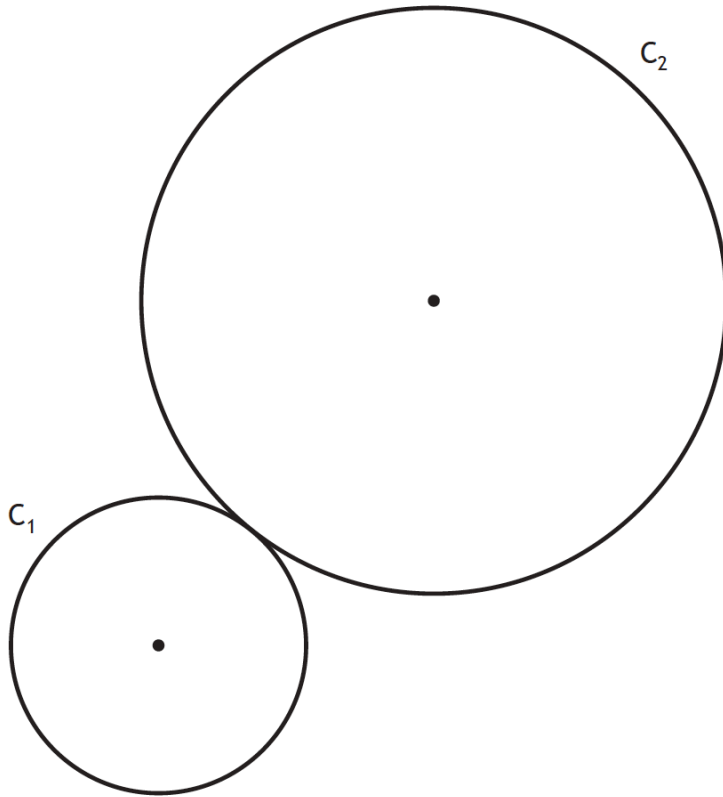
What is the value of k ?

2015 Paper 2 Question 5, (4) (4)

Circle C_1 has equation $x^2 + y^2 + 6x + 10y + 9 = 0$.

The centre of circle C_2 is $(9, 11)$.

Circles C_1 and C_2 touch externally.



(a) Determine the radius of C_2 .

A third circle, C_3 , is drawn such that:

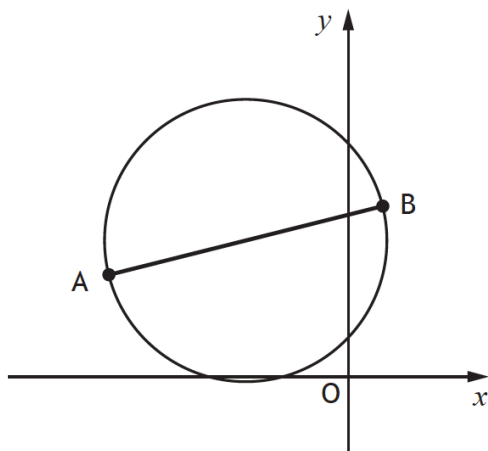
- both C_1 and C_2 touch C_3 internally
- the centres of C_1 , C_2 and C_3 are collinear.

(b) Determine the equation of C_3 .

2016 Paper 1 Question 4, (3)

A and B are the points $(-7, 3)$ and $(1, 5)$.

AB is a diameter of a circle.



Find the equation of this circle.

2016 Paper 1 Question 8, (5)

Show that the line with equation $y = 3x - 5$ is a tangent to the circle with equation $x^2 + y^2 + 2x - 4y - 5 = 0$ and find the coordinates of the point of contact.

2016 Paper 2 Question 4, (4) (3)

Circles C_1 and C_2 have equations $(x + 5)^2 + (y - 6)^2 = 9$
and $x^2 + y^2 - 6x - 16 = 0$ respectively.

- (a) Write down the centres and radii of C_1 and C_2 .
- (b) Show that C_1 and C_2 do not intersect.

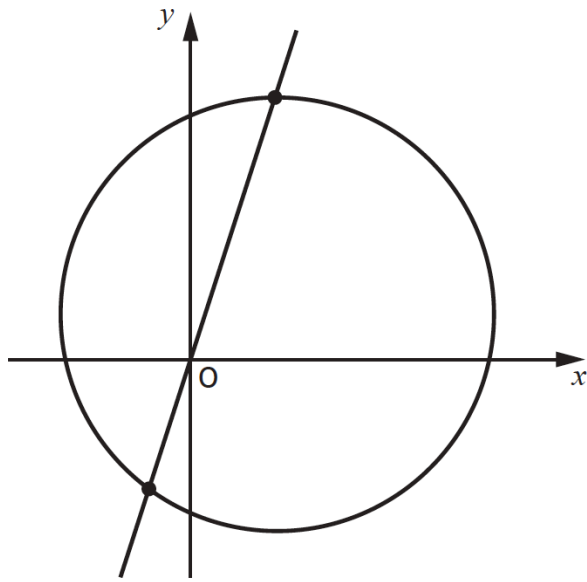
2017 Paper 1 Question 2, (4)

The point $P(-2, 1)$ lies on the circle $x^2 + y^2 - 8x - 6y - 15 = 0$.

Find the equation of the tangent to the circle at P .

2017 Paper 2 Question 3, (5)

The line $y=3x$ intersects the circle with equation $(x-2)^2 + (y-1)^2 = 25$.

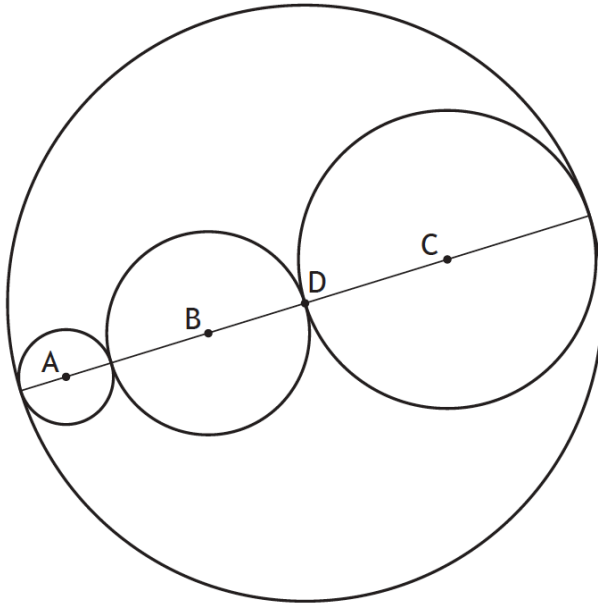


Find the coordinates of the points of intersection.

2017 Paper 2 Question 10, (3) (4)

(a) Show that the points $A(-7, -2)$, $B(2, 1)$ and $C(17, 6)$ are collinear.

Three circles with centres A , B and C are drawn inside a circle with centre D as shown.



The circles with centres A , B and C have radii r_A , r_B and r_C respectively.

- $r_A = \sqrt{10}$
- $r_B = 2r_A$
- $r_C = r_A + r_B$

(b) Determine the equation of the circle with centre D .