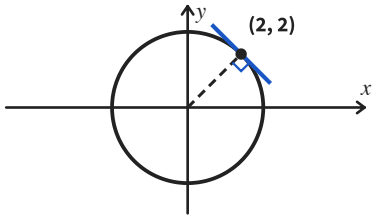
The equation of a tangent to a circle

ANSWERS

1

Find the equation of the tangent to $x^2 + y^2 = 8$ at the point $(2, 2)$.



gradient of radius = 1

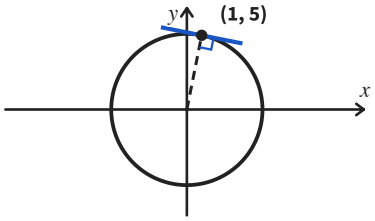
gradient of tangent = −1

c = 4

Equation $y = -x + 4$

2

Find the equation of the tangent to $x^2 + y^2 = 26$ at the point $(1, 5)$.



gradient of radius = 5

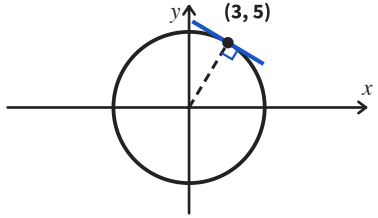
gradient of tangent = $-\frac{1}{5}$

c = $\frac{26}{5}$

Equation $y = -\frac{1}{5}x + \frac{26}{5}$

3

Find the equation of the tangent to $x^2 + y^2 = 34$ at the point $(3, 5)$.



gradient of radius = $\frac{5}{3}$

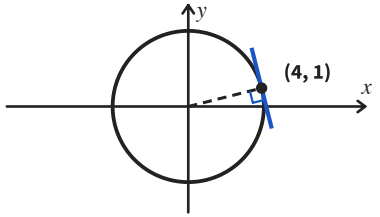
gradient of tangent = $-\frac{3}{5}$

c = $\frac{34}{5}$

Equation $y = -\frac{3}{5}x + \frac{34}{5}$

4

Find the equation of the tangent to $x^2 + y^2 = 17$ at the point $(4, 1)$.



gradient of radius = $\frac{1}{4}$

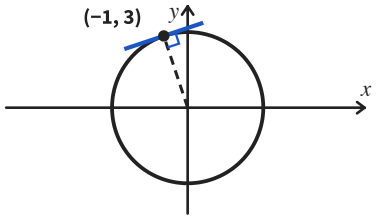
gradient of tangent = −4

c = 17

Equation $y = -4x + 17$

5 *Notice the change!*

Find the equation of the tangent to $x^2 + y^2 = 10$ at the point $(-1, 3)$.



gradient of radius = −3

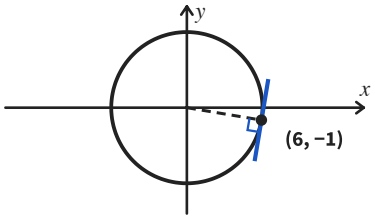
gradient of tangent = $\frac{1}{3}$

c = $\frac{10}{3}$

Equation $y = \frac{1}{3}x + \frac{10}{3}$

6

Find the equation of the tangent to $x^2 + y^2 = 37$ at the point $(6, -1)$.



gradient of radius = $-\frac{1}{6}$

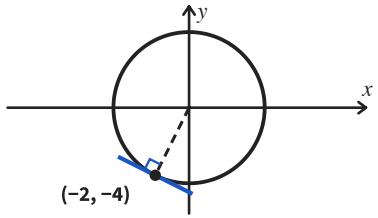
gradient of tangent = 6

c = −37

Equation $y = 6x - 37$

7

Find the equation of the tangent to $x^2 + y^2 = 20$ at the point $(-2, -4)$.



radius 2, tangent $-\frac{1}{2}$

$-4 = 1 + c$, so $c = -5$

Equation $y = -\frac{1}{2}x - 5$

8

Sam finds the tangent to $x^2 + y^2 = 58$ at $(3, 7)$. He flips the radius's gradient and uses $\frac{3}{7}$. Explain his mistake.

Find the correct equation.

no sign change: product 1, not −1

tangent $-\frac{3}{7}$, $c = \frac{58}{7}$

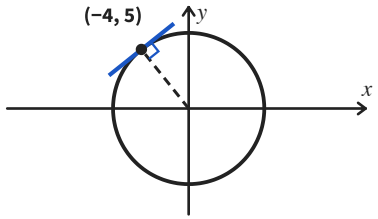
Equation $y = -\frac{3}{7}x + \frac{58}{7}$

The equation of a tangent to a circle *further practice*

ANSWERS

9

Find the equation of the tangent to $x^2 + y^2 = 41$ at the point $(-4, 5)$.



radius $-\frac{5}{4}$, tangent $\frac{4}{5}$

$5 = -\frac{16}{5} + c$, $c = \frac{41}{5}$

Answer $y = \frac{4}{5}x + \frac{41}{5}$

10

Find the equation of the tangent to $x^2 + y^2 = 25$ at $(-4, -3)$. Give it in the form $ax + by = k$, where a, b and k are whole numbers.

tangent $-\frac{4}{3}$, $c = -\frac{25}{3}$

multiply by 3: $3y = -4x - 25$

Answer $4x + 3y = -25$

11

Q is a point on the circle $x^2 + y^2 = 45$. Its y coordinate is 6 and it is to the left of the y axis. Find the equation of the tangent at Q.

$x^2 = 45 - 36 = 9$, so Q is $(-3, 6)$

radius -2, tangent $\frac{1}{2}$

Answer $y = \frac{1}{2}x + \frac{15}{2}$

12

An athlete swings a hammer round the circle $x^2 + y^2 = 5$, in metres.

She lets go at $(1, -2)$ and the hammer flies along the tangent. Where does its path cross the x axis?

$y = \frac{1}{2}x - \frac{5}{2}$

$y = 0$: $x = 5$

Answer $(5, 0)$

13

The tangent to $x^2 + y^2 = 45$ at $(3, 6)$ meets the x axis at A and the y axis at B. Find the area of triangle OAB, where O is the origin.

A$(15, 0)$, B$(0, \frac{15}{2})$

$\frac{1}{2} \times 15 \times \frac{15}{2} = \frac{225}{4}$

Answer 56.25 square units

14

Show that the line $y = 3x - 10$ is the tangent to $x^2 + y^2 = 10$ at $(3, -1)$.

$9 + 1 = 10$, and $3 \times 3 - 10 = -1$: on both

radius $-\frac{1}{3}$, and $-\frac{1}{3} \times 3 = -1$

Answer shown

15

The tangents to $x^2 + y^2 = 50$ at $(5, 5)$ and at $(7, -1)$ meet at T.
Find the coordinates of T.

$y = -x + 10$ and $y = 7x - 50$

$8x = 60$, $x = 7.5$

Answer $(7.5, 2.5)$

16

Explain why the tangents to $x^2 + y^2 = 29$ at $(2, 5)$ and at $(-2, -5)$ are parallel.

both radii have gradient $\frac{5}{2}$ (one diameter)

so both tangents have gradient $-\frac{2}{5}$

Answer the same gradient