

Exercise 5.5

- Find the equation of each of the following circles:
 - centre (3, 2), radius 3,
 - centre (-2, -1), radius 4,
 - centre (3, 4) and passing through the origin,
 - radius 3 units and touching both axes,
 - centre (1, 1) and touching the line $2x - y + 4 = 0$,
 - centre (3, -2) and touching the line $x + y - 3 = 0$.
- State the centre and radius of each of the following circles:
 - $x^2 + y^2 + 4x + 6y - 3 = 0$
 - $x^2 + y^2 - 6x + 10y - 15 = 0$
 - $2x^2 + 2y^2 - 8x - 6y - 7 = 0$
 - $3x^2 + 3y^2 - 9x + 4y - 1 = 0$
 - $2x^2 + 2y^2 - 10x + 6y + 9 = 0$
- Determine if each of the following equations represent a circle, stating its centre and radius.
 - $x^2 + y^2 - 2x + 2y - 4 = 0$
 - $x^2 + y^2 + 4x - 6y + 15 = 0$
 - $4x^2 + 4y^2 - 20x + 8y - 31 = 0$
 - $2x^2 + 2y^2 - 5x + 10y + 16 = 0$
 - $9x^2 + 9y^2 - 12x + 24y - 16 = 0$
- Find the equation of the circle that passes through the points (1, 6), (3, 3) and having its centre on the line $4x + 3y + 1 = 0$.
- Find the equation of the circle that passes through the points in each of the following cases.
 - (0, 1), (0, 4) and (2, 5)
 - (2, 3) (4, -1) and (2, -1)
 - (-3, 2), (-2, 5) and (2, 1)
- Find the equation of the tangent to the given circle at the given point on the circle in each of the following cases:
 - $x^2 + y^2 - 4x - 6y - 37 = 0$; (3, -4)
 - $x^2 + y^2 + 6x - 2y - 24 = 0$; (2, -2)
 - $x^2 + y^2 + 8x + 6y + 5 = 0$; (-6, 1)
 - $x^2 + y^2 - 6x + 3y - 5 = 0$; (-1, -2)
 - $x^2 + y^2 - 6x + 4y + 3 = 0$; (0, -1)
- Determine if the given line is a tangent to the given circle in each of the following cases, and find its point of contact.
 - $x + y = 3$; $x^2 + y^2 + 2x - 7 = 0$
 - $5x + 7y = 41$; $x^2 + y^2 - 3x + y - 16 = 0$
 - $4x - 9y = 11$; $4x^2 + 4y^2 + 4x - 10y - 17 = 0$
- Find the equations of the tangents from the origin to the given circle in each of the following cases.
 - $x^2 + y^2 - 5x - 5y + 10 = 0$
 - $x^2 + y^2 - 10x - 6y + 25 = 0$
 - $x^2 + y^2 + 10x - 2y + 13 = 0$

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- $x^2 + y^2 - 6x - 4y + 4 = 0$
 - $x^2 + y^2 + 4x + 2y - 11 = 0$
 - $x^2 + y^2 - 6x - 8y = 0$
 - $x^2 + y^2 \pm 6x \pm 6y + 9 = 0$
 - $x^2 + y^2 - 2x - 2y - 3 = 0$
 - $x^2 + y^2 - 6x + 4y + 11 = 0$
- (-2, -3), 4
 - (3, -5), 7
 - $(2, \frac{3}{2}), \frac{1}{2}\sqrt{39}$
 - $(\frac{3}{2}, -\frac{2}{3}), \frac{1}{6}\sqrt{109}$
 - $(\frac{5}{2}, -\frac{3}{2}), 2$
- Yes, (-1, 1), $\sqrt{6}$
 - No
 - Yes, $(\frac{5}{2}, -1), \sqrt{15}$
 - No
 - Yes, $(\frac{2}{3}, -\frac{4}{3}), 2$
- $2x^2 + 2y^2 + 7x - 8y - 33 = 0$
- $x^2 + y^2 - 4x - 5y + 4 = 0$
 - $x^2 + y^2 - 6x - 2y + 5 = 0$
 - $2x^2 + 2y^2 + x - 11y - 1 = 0$
- $x - 7y - 31 = 0$
 - $x - 2y + 8 = 0$
 - $y - 3x + 1 = 0$
 - $5x - 3y - 16 = 0$
 - $8x + y + 10 = 0$
- Yes, (1, 2)
 - Yes, $(\frac{1}{2}, -1)$
 - Yes, (4, 3)
- $y = 3x, 3y = x$
 - $y = 0, 8y = 15x$
 - $3y = 2x, 2y = -3x$