

Geometry & Vectors

Exercises 5

- 1) Find the equation of the line through the point $(-2, -3)$ and parallel to the line $3x - 7y + 4 = 0$.
- 2) Find the distance of the point $(3, 2)$ from the line $2x + 4y - 4 = 0$.
- 3) Find the distance between the lines $3x + 4y - 7 = 0$ and $3x + 4y + 3 = 0$.
- 4) Find the centre, foci, length of major and minor axis for the given ellipse

$$i) \quad 1 = \frac{x^2}{9} + \frac{y^2}{4},$$

$$ii) \quad 1 = \frac{x^2}{4} + \frac{y^2}{9},$$

$$iii) \quad 27 = 4x^2 + 9y^2 - 18y,$$

$$iv) \quad 64 = 4(x - 1)^2 + y^2,$$

$$v) \quad 0 = 4x^2 + y^2 - 6y + 5.$$

- 5) Find the equation of the tangents to the ellipse with equation

$$\frac{x^2}{25} + \frac{y^2}{9} = 1$$

which passes through the point $P(0, 6)$.

- 6) Find the equation of the tangents to the hyperbola with equation

$$x^2 - 4y^2 - 5 = 0$$

which passes through the point $P(15, 10)$.

- 7) Find the equation of the tangents to the parabola with equation

$$y^2 - y - 2x + 4 = 0$$

which passes through the point $P(-5, 2)$.

- 8) Determine which type of conic is described by the following equation and find the eccentricities

$$i) \quad 0 = 5x^2 - 6xy + 5y^2 - 9,$$

$$ii) \quad 0 = 157x^2 + 270xy + 13y^2 + 34,$$

$$iii) \quad 0 = 3x^2 - 2\sqrt{3}xy + y^2 + 2x + 2\sqrt{3}y,$$

Solutions exercises 5

1) $3x - 7y - 15 = 0$

2) $\sqrt{5}$

3) 2

4)

i) $(0, 0), (\pm\sqrt{5}, 0), 6, 4$ *ii)* $(0, 0), (0, \pm\sqrt{5}), 6, 4$
iii) $(0, 1), (\pm\sqrt{5}, 1), 6, 4$ *iv)* $(1, 0), (1, \pm 4\sqrt{3}), 16, 8$
v) $(0, 3), (0, 3 \pm \sqrt{3}), 4, 2.$

5) $3\sqrt{3}x + 5y - 30 = 0$ and $3\sqrt{3}x - 5y + 30 = 0$

6) $3x - 4y - 5 = 0$ and $27x - 44y + 35 = 0$

7) $y - 2 = \frac{2}{11}(x + 5)$ and $y - 2 = -\frac{2}{5}(x + 5)$

8)

i) ellipse with $e = \sqrt{3}/2,$
ii) hyperbola with $e = 3/\sqrt{7},$
iii) parabola with $e = 1,$