

Exercise walk-through

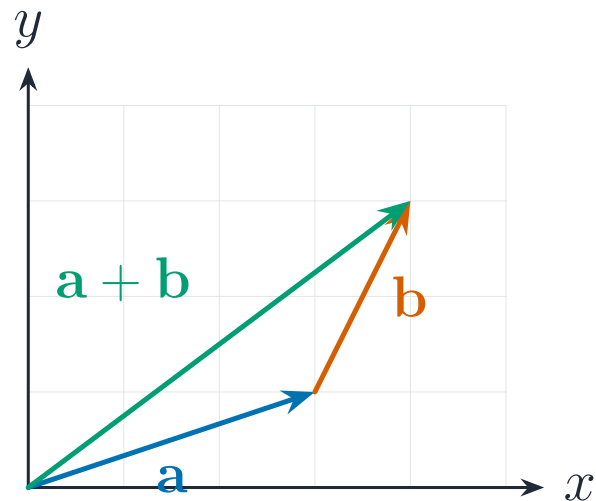
4.6

Conic Sections

AP Precalculus

What we will cover

- 1 Parametric functions
- 2 Planar motion & rates
- 3 Circles lines & conics
- 4 Implicit curves
- 5 Vectors
- 6 Matrices & determinants
- 7 Linear transformations



Implicit curves and conic sections

An **implicitly defined** curve is an equation in x and y – not solved for y . The **conic sections** :

- circle $x^2 + y^2 = r^2$
- ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$
- hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$
- parabola $y = ax^2$

To **parametrize** an implicit curve, find $x(t)$ and $y(t)$ that satisfy the equation for every t – for a circle, $\cos^2 t + \sin^2 t = 1$ does it **automatically**.

Implicit equations and the four conics

implicit

an equation relating x and y **without solving** for either – $x^2 + y^2 = 25$

the consequence

its graph may **fail the vertical-line test**, so it need not be a function at all

conic sections

circles, ellipses, parabolas and hyperbolas – the curves you get by slicing a cone

each is a quadratic

one general second-degree equation in x and y covers all four

telling them apart

the signs and coefficients of x^2 and y^2 : equal – circle; same sign, unequal – ellipse; one missing – parabola; opposite signs – hyperbola

Complete the square in both variables to get the standard form, and the centre, radius or axes read straight off it.

Exercises 2.1-2.3

2.1 Name the four conic sections.

[1]

2.2 State the standard equation of an ellipse.

[1]

2.3 Identify the conic $\frac{x^2}{9} + \frac{y^2}{4} = 1$.

[2]

Exercises 2.1-2.3

2.1 Name the four conic sections.

[1]

2.1

- circle, ellipse, parabola, hyperbola
-

2.2 State the standard equation of an ellipse.

[1]

2.2

- $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$
-

2.3 Identify the conic $\frac{x^2}{9} + \frac{y^2}{4} = 1$.

[2]

2.3

- an ellipse

Exercises 3.1-3.2

3.1 The equation $\frac{x^2}{16} + \frac{y^2}{9} = 1$ is

[1]

☐

A a circle

B an ellipse

C a parabola

D a hyperbola

☐

3.2 The equation $x^2 - y^2 = 1$ is

[1]

A a circle

B an ellipse

C a hyperbola

D a line

Exercises 3.1·3.2

3.1 The equation $\frac{x^2}{16} + \frac{y^2}{9} = 1$ is

[1]

☐

A a circle

B an ellipse

C a parabola

D a hyperbola

3.1 B

- an ellipse.

3.2 The equation $x^2 - y^2 = 1$ is

[1]

☐

A a circle

B an ellipse

C a hyperbola

D a line

3.2 C

- a hyperbola.

Exercise 3.3 (a)

3.3 Classify each conic.

(a) $x^2 + y^2 = 25$.

[1]

Exercise 3.3 (a)

3.3 Classify each conic.

(a) $x^2 + y^2 = 25$.

[1]

(a)

- circle

Exercise 3.3 (b)

3.3 Classify each conic.

(b) $y = x^2$.

[1]

Exercise 3.3 (b)

3.3 Classify each conic.

(b) $y = x^2$.

[1]

(b)

- parabola

Exercise 3.3 (c)

3.3 Classify each conic.

(c) $\frac{x^2}{4} - \frac{y^2}{9} = 1.$

[1]

Exercise 3.3 (c)

3.3 Classify each conic.

(c) $\frac{x^2}{4} - \frac{y^2}{9} = 1.$

[1]

(c)

- hyperbola