

Exercise walk-through

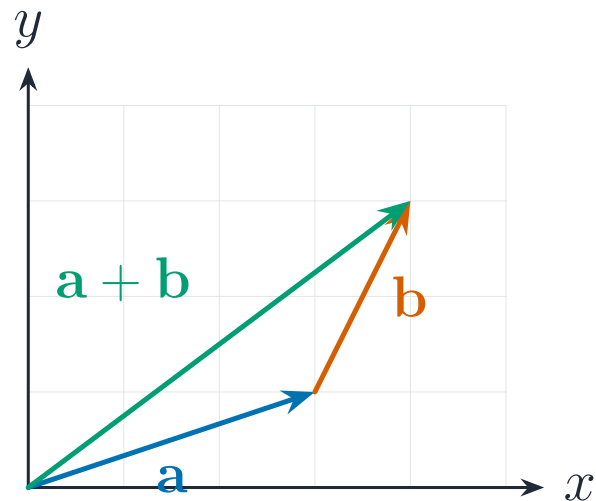
4.4

Parametrically Defined Circles and Lines

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 Write parametric equations for a circle of radius 5.

[2]

2.2 State the radius of $x = 2 \cos t$, $y = 2 \sin t$.

[1]

2.3 For the line $x = 1 + 2t$, $y = 3 + t$, state the point at $t = 0$.

[1]

Exercises 2.1-2.3

2.1 Write parametric equations for a circle of radius 5. [2]

2.1

- $x = 5 \cos t, y = 5 \sin t$
-

2.2 State the radius of $x = 2 \cos t, y = 2 \sin t$. [1]

2.2

- 2
-

2.3 For the line $x = 1 + 2t, y = 3 + t$, state the point at $t = 0$. [1]

2.3

- $(1, 3)$

Exercises 3.1·3.2

3.1 A circle of radius r is

[1]

☐

A $x = rt, y = rt$

B $x = r \cos t, y = r \sin t$

C $x = t, y = r$

D $x = r + t, y = r - t$

☐

3.2 The line $x = x_0 + at, y = y_0 + bt$ passes through

[1]

A the origin

B (x_0, y_0) at $t = 0$

C (a, b)

D (t, t)

Exercises 3.1·3.2

3.1 A circle of radius r is

[1]

☐

A $x = rt, y = rt$

B $x = r \cos t, y = r \sin t$

C $x = t, y = r$

D $x = r + t, y = r - t$

3.1 B

- $x = r \cos t, y = r \sin t$.

3.2 The line $x = x_0 + at, y = y_0 + bt$ passes through

[1]

☐

A the origin

B (x_0, y_0) at $t = 0$

C (a, b)

D (t, t)

3.2 B

- (x_0, y_0) at $t = 0$.

Exercise 3.3 (a)

3.3 $x = 4 \cos t$, $y = 4 \sin t$.

(a) State the shape.

[1]

Exercise 3.3 (a)

3.3 $x = 4 \cos t$, $y = 4 \sin t$.

(a) State the shape.

[1]

(a)

- a circle

Exercise 3.3 (b)

3.3 $x = 4 \cos t$, $y = 4 \sin t$.

(b) State the radius.

[1]

Exercise 3.3 (b)

3.3 $x = 4 \cos t$, $y = 4 \sin t$.

(b) State the radius.

[1]

(b)

- 4

Exercise 3.3 (c)

3.3 $x = 4 \cos t$, $y = 4 \sin t$.

(c) State the point at $t = 0$.

[1]

Exercise 3.3 (c)

3.3 $x = 4 \cos t, y = 4 \sin t.$

(c) State the point at $t = 0$.

[1]

(c)

- $(4, 0)$