

Exercise walk-through

3.4

Sine and Cosine Function Graphs

AP Precalculus

What we will cover

- 1 Periodic phenomena
- 2 Sine cosine & tangent
- 3 Sinusoidal functions
- 4 Transformations & modelling
- 5 Inverse trig & equations
- 6 Identities
- 7 Polar functions

Inverse trigonometric functions

Sine, cosine and tangent are **not** one-to-one, so each inverse needs a **restricted domain**.

An inverse trig function **returns an angle** – and only the one in its restricted range.

arcsin: range $[-\frac{\pi}{2}, \frac{\pi}{2}]$

arccos: range $[0, \pi]$

arctan: range $(-\frac{\pi}{2}, \frac{\pi}{2})$

The identities the exam expects

Pythagorean identity

$\sin^2 \theta + \cos^2 \theta = 1$, and its two derived forms with $\tan$ and $\cot$

sum identities

$\sin(a \pm b) = \sin a \cos b \pm \cos a \sin b$; $\cos(a \pm b) = \cos a \cos b \mp \sin a \sin b$

double-angle

$\sin 2\theta = 2 \sin \theta \cos \theta$; $\cos 2\theta = \cos^2 \theta - \sin^2 \theta = 1 - 2 \sin^2 \theta$

arcsine

and friends

inverse trig functions need a **restricted domain** to be functions at all

the special triangles

the **equilateral triangle**
60°; the square halved gives 45°

halved gives 30°

Every one of these lets you rewrite an expression into a form you can solve. Identities are **tools for rewriting**, not facts to recite.

Exercises 2.1·2.3

2.1 State the period of $y = \sin x$.

[1]

2.2 State the range of $y = \cos x$.

[1]

2.3 State the amplitude and midline of $y = \sin x$.

[2]

Exercises 2.1-2.3

2.1 State the period of $y = \sin x$. [1]

2.1

- 2π
-

2.2 State the range of $y = \cos x$. [1]

2.2

- $[-1, 1]$
-

2.3 State the amplitude and midline of $y = \sin x$. [2]

2.3

- amplitude 1; midline $y = 0$

Exercises 3.1·3.2

3.1 The period of $y = \sin x$ is

[1]

☐

A π

B 2π

C $\frac{\pi}{2}$

D 1

3.2 The range of $y = \cos x$ is

[1]

☐

A all real numbers

B $[0, 1]$

C $[-1, 1]$

D $[-2, 2]$

Exercises 3.1·3.2

3.1 The period of $y = \sin x$ is

[1]

☐

A π

B 2π

C $\frac{\pi}{2}$

D 1

3.1 B

- 2π .

3.2 The range of $y = \cos x$ is

[1]

☐

A all real numbers

B $[0, 1]$

C $[-1, 1]$

D $[-2, 2]$

3.2 C

- $[-1, 1]$.

Exercise 3.3 (a)

3.3 $y = \sin x$.

(a) State its maximum value.

[1]

Exercise 3.3 (a)

3.3 $y = \sin x$.

(a) State its maximum value.

[1]

(a)

- 1

Exercise 3.3 (b)

3.3 $y = \sin x$.

(b) State its minimum value.

[1]

Exercise 3.3 (b)

3.3 $y = \sin x$.

(b) State its minimum value.

[1]

(b)

- -1

Exercise 3.3 (c)

3.3 $y = \sin x$.

(c) State the smallest $x > 0$ where the maximum occurs.

[1]

Exercise 3.3 (c)

3.3 $y = \sin x$.

(c) State the smallest $x > 0$ where the maximum occurs.

[1]

(c)

- $x = \frac{\pi}{2}$