

# 3.12 Equivalent Representations of Trigonometric Functions

Name: \_\_\_\_\_ Class: \_\_\_\_\_ Date: \_\_\_\_\_

Total: 9 marks

KEY WORDS pythagorean identity 勾股恒等式

## Objective

Build the skills to answer exam questions on **equivalent representations of trigonometric functions**.

You must be able to:

- apply the **Pythagorean identity** 勾股恒等式  $\sin^2 x + \cos^2 x = 1$
- use the even/odd symmetry of sine and cosine

## 1 Worked examples

Study these first. Each one shows the method for a question type used later.

### ■ Key identities

- **Pythagorean:**  $\sin^2 x + \cos^2 x = 1$ , so  $\cos^2 x = 1 - \sin^2 x$ ;
- **even/odd:**  $\cos(-x) = \cos x$  (even),  $\sin(-x) = -\sin x$  (odd).

### ■ Example

If  $\sin x = \frac{3}{5}$ , then  $\cos^2 x = 1 - \frac{9}{25} = \frac{16}{25}$ , so  $\cos x = \pm \frac{4}{5}$ .

## 2 Practice

2.1 State the Pythagorean identity. [1]

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2.2 Rewrite  $1 - \cos^2 x$ . [1]

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2.3 State  $\sin(-x)$  in terms of  $\sin x$ . [2]

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### 3 Exam-style questions

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**3.1** The Pythagorean identity is [1]

- **A**  $\sin x + \cos x = 1$
  - **B**  $\sin^2 x + \cos^2 x = 1$
  - **C**  $\sin^2 x - \cos^2 x = 1$
  - **D**  $\sin x \cdot \cos x = 1$
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**3.2**  $\cos(-x)$  equals [1]

- **A**  $-\cos x$
  - **B**  $\cos x$
  - **C**  $\sin x$
  - **D**  $-\sin x$
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**3.3** Given  $\sin x = \frac{3}{5}$ .

(a) State  $\sin^2 x$ . [1]

(b) Use the identity to find  $\cos^2 x$ . [1]

(c) State a possible value of  $\cos x$ . [1]

## Solutions

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**2.1**  $\sin^2 x + \cos^2 x = 1.$

**2.2**  $\sin^2 x.$

**2.3**  $\sin(-x) = -\sin x.$

**3.1** B.

**3.2** B.

**3.3** (a)  $\frac{9}{25}.$  (b)  $1 - \frac{9}{25} = \frac{16}{25}.$  (c)  $\frac{4}{5}$  (or  $-\frac{4}{5}$ ).