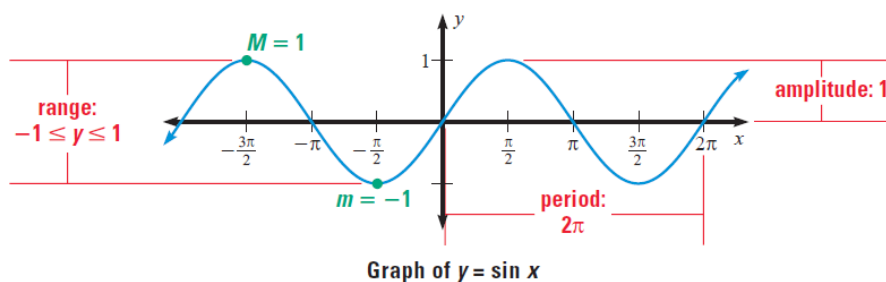


## Sine function



### KEY POINT 8.12

The function  $y = a \sin b(x + c) + d$  and

- amplitude  $a = \frac{\max - \min}{2}$ ,  $d = \frac{\min + \max}{2}$ .
- period  $\frac{2\pi}{b}$
- minimum value  $d - a$  and maximum value  $d + a$

### Question 1:

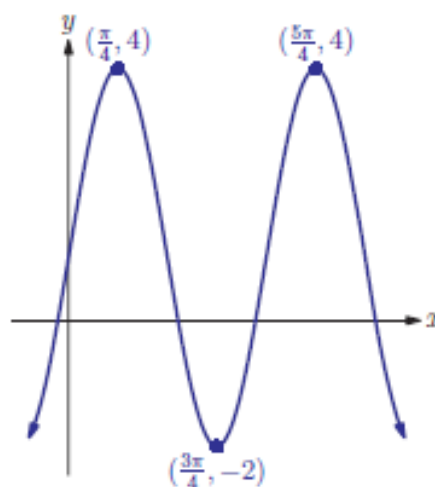
- Sketch the graph of  $y = \sin x + 2$  for  $x \in [0, 2\pi]$ .
- Find the maximum and the minimum values of the function.

### Question 2:

Find the exact values of  $x$  for which the function  $y = \sin 3(x + 1)$  attains its maximum value.

**Question 3:**

The graph shown has equation  $y = a \sin(bx) + d$ . Find the values of  $a$ ,  $b$  and  $d$ .



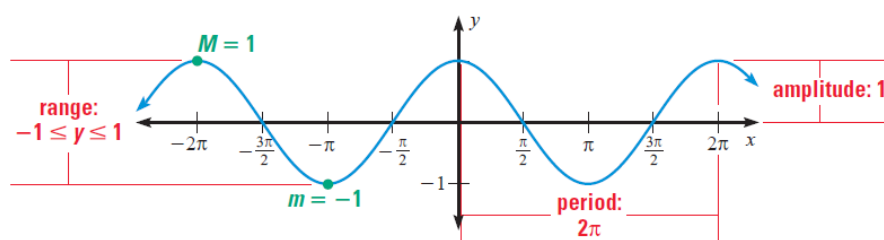
**Question 4:**

Sketch the following graphs, indicating any axis intercepts.

(i)  $y = 2 \sin(x + 45^\circ)$  for  $-180^\circ \leq x \leq 180^\circ$

(ii)  $y = 2 \sin x + 1$  for  $-360^\circ \leq x \leq 360^\circ$

## Cosine function



Graph of  $y = \cos x$

### KEY POINT 8.12

The function

$y = a \cos b(x + c) + d$  have

- amplitude  $a = \frac{\text{max} - \text{min}}{2}$ .  $d = \frac{\text{min} + \text{max}}{2}$ .
- period  $\frac{2\pi}{b}$
- minimum value  $d - a$  and maximum value  $d + a$

### Question 1:

- Sketch the graph of  $y = 4 \cos\left(\frac{x}{3}\right)$  for  $0 \leq x \leq 6\pi$ .
- Write down the amplitude and the period of the function.

#### EXAM HINT

'Write down' means that you do not need to show working.

### Question 2:

- Sketch the graph of  $y = \cos(x + 30^\circ)$  for  $0^\circ \leq x \leq 360^\circ$ .
- State the minimum and maximum values of the function, and the values of  $x$  at which they occur.

**Question 3:**

Sketch the following graphs, giving the coordinates of maximum and minimum points.

(a) (i)  $y = \cos\left(x - \frac{\pi}{3}\right)$  for  $0 \leq x \leq 2\pi$

(ii)  $y = 3\cos(x - 60^\circ)$  for  $-180^\circ \leq x \leq 180^\circ$

(ii)  $y = 3 - 2\cos x$  for  $0^\circ \leq x \leq 360^\circ$