

Check Your Understanding

Practise

1. Determine the phase shift and the vertical displacement with respect to $y = \sin x$ for each function. Sketch a graph of each function.

- $y = \sin(x - 50^\circ) + 3$
- $y = \sin(x + \pi)$
- $y = \sin\left(x + \frac{2\pi}{3}\right) + 5$
- $y = 2 \sin(x + 50^\circ) - 10$
- $y = -3 \sin(6x + 30^\circ) - 3$
- $y = 3 \sin\frac{1}{2}(x - \frac{\pi}{4}) - 10$

2. Determine the phase shift and the vertical displacement with respect to $y = \cos x$ for each function. Sketch a graph of each function.

- $y = \cos(x - 30^\circ) + 12$
- $y = \cos\left(x - \frac{\pi}{3}\right)$
- $y = \cos\left(x + \frac{5\pi}{6}\right) + 16$
- $y = 4 \cos(x + 15^\circ) + 3$
- $y = 4 \cos(x - \pi) + 4$
- $y = 3 \cos\left(2x - \frac{\pi}{6}\right) + 7$

3. a) Determine the range of each function.

- $y = 3 \cos\left(x - \frac{\pi}{2}\right) + 5$
- $y = -2 \sin(x + \pi) - 3$
- $y = 1.5 \sin x + 4$
- $y = \frac{2}{3} \cos(x + 50^\circ) + \frac{3}{4}$

- b) Describe how to determine the range when given a function of the form $y = a \cos b(x - c) + d$ or $y = a \sin b(x - c) + d$.

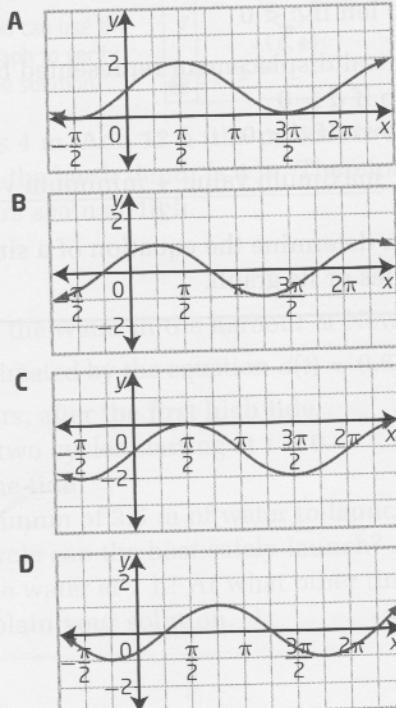
4. Match each function with its description in the table.

- $y = -2 \cos 2(x + 4) - 1$
- $y = 2 \sin 2(x - 4) - 1$
- $y = 2 \sin(2x - 4) - 1$
- $y = 3 \sin(3x - 9) - 1$
- $y = 3 \sin(3x + \pi) - 1$

	Amplitude	Period	Phase Shift	Vertical Displacement
A	3	$\frac{2\pi}{3}$	3 right	1 down
B	2	π	2 right	1 down
C	2	π	4 right	1 down
D	2	π	4 left	1 down
E	3	$\frac{2\pi}{3}$	$\frac{\pi}{3}$ left	1 down

5. Match each function with its graph.

- $y = \sin\left(x - \frac{\pi}{4}\right)$
- $y = \sin\left(x + \frac{\pi}{4}\right)$
- $y = \sin x - 1$
- $y = \sin x + 1$



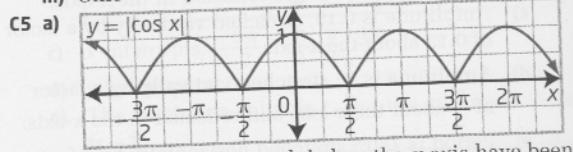
- c) Example:
The function
 $y = \sqrt{\sin x + 1}$
is defined for all
values of x , while
the function
 $y = \sqrt{\sin x}$ is not.

24. It is sinusoidal and the period is 2π .

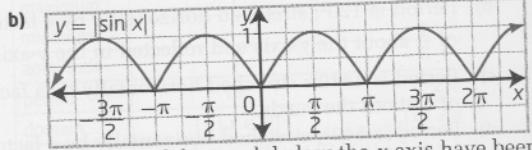
C1 Step 5

- a) The x -coordinate of each point on the unit circle represents $\cos \theta$. The y -coordinate of each point on the unit circle represents $\sin \theta$.
- b) The y -coordinates of the points on the sine graph are the same as the y -coordinates of the points on the unit circle. The y -coordinates of the points on the cosine graph are the same as the x -coordinates of the points on the unit circle.
- c2 The constant is 1. The sum of the squares of the legs of each right triangle is equal to the radius of the unit circle, which is always 1.
- c3 a) Cannot determine because the amplitude is not given.
b) $f(4) = 0$; given in the question.
c) $f(84) = 0$; the period is 40° so it returns to 0 every 40° .

- C4 a) Sine and Cosine b) Sine and Cosine
c) Sine and Cosine d) Sine and Cosine
e) Sine f) Cosine g) Cosine h) Sine
i) Cosine j) Sine k) Cosine l) Sine
m) Sine n) Cosine

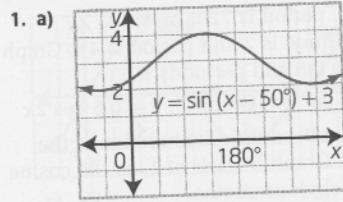


The parts of the graph below the x -axis have been reflected across the x -axis.

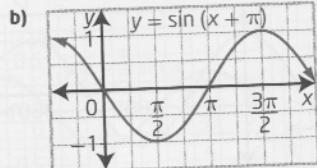


The parts of the graph below the x -axis have been reflected across the x -axis.

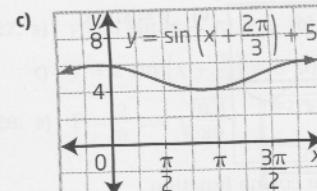
5.2 Transformations of Sinusoidal Functions,
pages 250 to 255



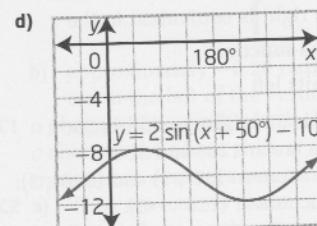
The phase shift is 50° right.
The vertical displacement is 3 units up.



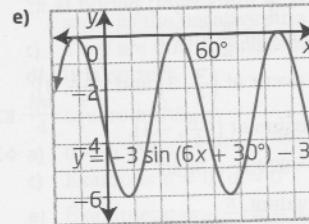
The phase shift is π units left.
There is no vertical displacement.



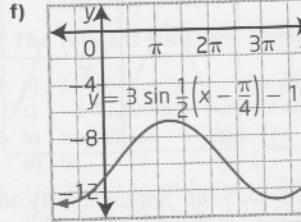
The phase shift is $\frac{2\pi}{3}$ units left.
The vertical displacement is 5 units up.



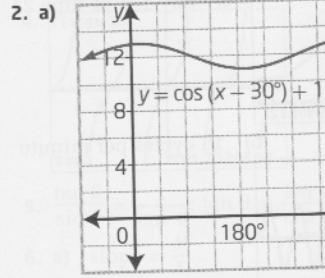
The phase shift is 50° left.
The vertical displacement is 10 units down.



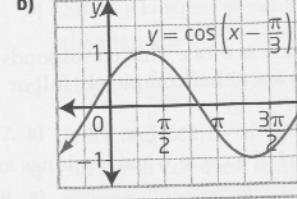
The phase shift is 5° left.
The vertical displacement is 3 units down.



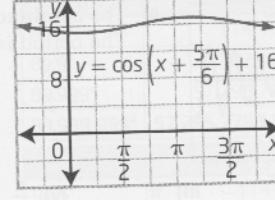
The phase shift is $\frac{\pi}{4}$ units right.
The vertical displacement is 10 units down.



The phase shift is 30° right.
The vertical displacement is 12 units up.



The phase shift is $\frac{\pi}{3}$ units right.
There is no vertical displacement.



The phase shift is $\frac{5\pi}{6}$ units left.
The vertical displacement is 16 units up.