

## Mystery Sinusoid

### Quiz: Mystery Sinusoid

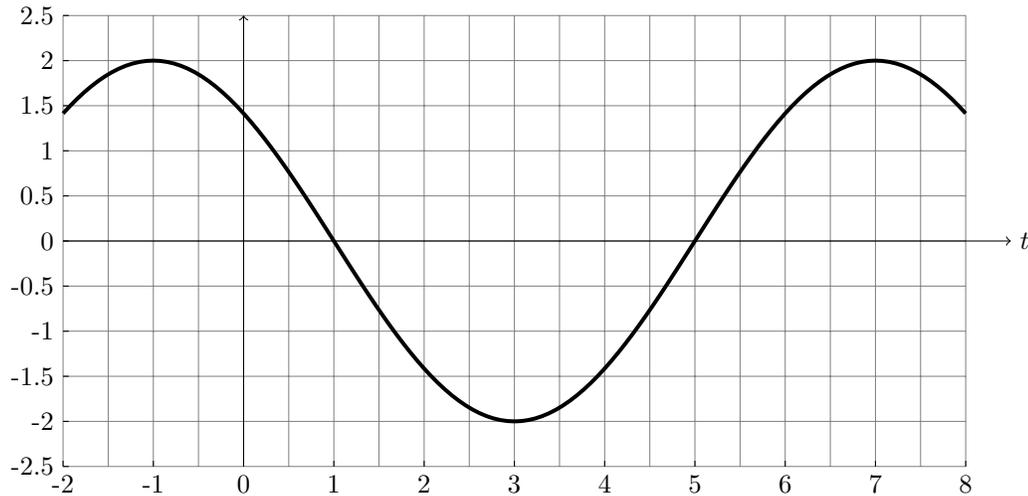


Fig. 1. Mystery sinusoid.

The graph of a sinusoidal function is displayed. The problem is to express it in the *standard form*

$$f(t) = A \cos(\omega t - \phi).$$

#### Choices:

- a)  $2 \cos(4\pi t + \frac{\pi}{4})$       b)  $2 \cos(\frac{\pi}{4}t + \frac{\pi}{4})$       c)  $2 \cos(4\pi t - \frac{\pi}{4})$   
d)  $2 \cos(\frac{\pi}{4}t - \frac{\pi}{4})$       e)  $2 \cos(4t + 1)$       f)  $2 \cos(4t - 1)$

**Answer:** The answer is (b)

The graph runs vertically between 2 and -2, so the amplitude is  $A = 2$ .

There are consecutive peaks at -1 and 7, so the period  $P = 8$ . Therefore, the angular frequency  $\omega = 2\pi/P = \pi/4$ .

The curve has a time lag of  $\tau = -1$  (see the peak at -1). Since  $\tau = \phi/\omega$ , we have  $\phi = -\omega = -\pi/4$ .

Hence the equation of the sinusoid is:

$$A \cos(\omega t - \phi) = 2 \cos\left(\frac{\pi}{4}t + \frac{\pi}{4}\right).$$

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