Quiz:

Figure 1: Mystery sinusoid.

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

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

Think about your answer and then look at the choices.

Choices:

a) $f(t) = 2\cos\left(4\pi t + \frac{\pi}{4}\right)$

b) $f(t) = 2\cos\left(\frac{\pi}{4}t + \frac{\pi}{4}\right)$

c) $f(t) = 2\cos\left(4\pi t - \frac{\pi}{4}\right)$

d) $f(t) = 2\cos\left(\frac{\pi}{4}t - \frac{\pi}{4}\right)$

e) $f(t) = 2\cos\left(4t + 1\right)$

f) $f(t) = 2\cos\left(4t - 1\right)$

Pick what you think is the correct choice and then look at the answer.

Answer:
The answer is (d).

I've put a bunch of words in to glue the equations together. Please double check my descriptions, especially of t_0. – HB

On the graph, the vertical distance between a "peak" and a "trough" of the graph is 4, so the amplitude is $A = 2$. The function's period is $P = 8$, and we know $P = 2\pi/\omega$, so the angular frequency is $\omega = \frac{\pi}{4}$. The graph is

"shifted to the left" one unit, so the delay is $t_0 = \phi/\omega = -1$ and the phase lag is $\phi = -\frac{\pi}{4}$. Hence the equation of the sinusoid is:

$$f(t) = 2\cos\left(\frac{2\pi}{8}(t+1)\right) = 2\cos\left(\frac{\pi}{4}t + \frac{\pi}{4}\right).$$