

## Period of the Simple Harmonic Oscillator

**Quiz:** What is the period of a nonzero solution of  $\ddot{x} + 4x = 0$ ?

**Choices:**

- a) Depends upon the solution
- b) 2
- c)  $\pi$
- d) 4
- e)  $2\pi$
- f)  $\pi/2$
- g) None of these.

**Answer:** (c)  $\pi$ .

We have the natural frequency  $\omega_0 = \sqrt{k/m} = 2$ , so the general solution is

$$x(t) = c_1 \cos(2t) + c_2 \sin(2t) = A \cos(2t - \phi)$$

in both rectangular and phase-amplitude form respectively.

(As a check, think of what  $t$  has to do to take  $2t$  from 0 to  $2\pi$ ; or alternatively use  $P = 2\pi/\omega_0$ , with  $\omega_0 = 2$ .)

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