

68. We adjust the phase constant ϕ in Eq. 16-3 so that $x = -x_m$ when $t = 0$.

$$-x_m = x_m \cos \phi \implies \phi = \pi \text{ rad} .$$

We also note that $\omega = 2\pi/T = 5\pi \text{ rad/s}$.

(a) With this information, Eq. 16-3 becomes

$$x = 0.10 \cos (5\pi t + \pi)$$

where t is in seconds and x is in meters.

(b) By taking the derivative of the previous expression (or by plugging into Eq. 16-6) we have

$$v = -0.50\pi \sin (5\pi t + \pi)$$

with SI units again understood. Both of these expressions can be simplified using standard trig identities.