103. Since the particle has zero speed (momentarily) at $x \neq 0$, then it must be at its turning point; thus, $x_o = x_m = 0.37$ cm. It is straightforward to infer from this that the phase constant ϕ in Eq. 16-2 is zero. Also, $f = 0.25$ Hz is given, so we have $\omega = 2\pi f = \pi/2$ rad/s. The variable t is understood to take values in seconds.

(a) The period is $T = 1/f = 4.0$ s.

(b) As noted above, $\omega = \frac{\pi}{2}$ rad/s.

(c) The amplitude, as observed above, is 0.37 cm.

(d) Eq. 16-3 becomes $x = (0.37)\cos(\pi t/2)$ in centimeters.

(e) The derivative of x is $v = -(0.37)(\pi/2)\sin(\pi t/2) \approx (-0.58)\sin(\pi t/2)$ in centimeters-per-second.

(f) From the previous part, we conclude $v_m = 0.58$ cm/s.

(g) The acceleration-amplitude is $a_m = \omega^2 x_m = 0.91$ cm/s^2.

(h) Making sure our calculator is in radians mode, we find $x = (0.37)\cos(\pi(3.0)/2) = 0$. It is important to avoid rounding off the value of π in order to get precisely zero, here.

(i) With our calculator still in radians mode, we obtain $v = -(0.58)\sin(\pi(3.0)/2) = 0.58$ cm/s.