12. (a) Making sure our calculator is in radians mode, we find

$$x = 6.0 \cos\left(3\pi(2.0) + \frac{\pi}{3}\right) = 3.0 \text{ m} .$$

(b) Differentiating with respect to time and evaluating at $t = 2.0$ s, we find

$$v = \frac{dx}{dt} = -3\pi(6.0) \sin\left(3\pi(2.0) + \frac{\pi}{3}\right) = -49 \text{ m/s} .$$

(c) Differentiating again, we obtain

$$a = \frac{dv}{dt} = -(3\pi)^2(6.0) \cos\left(3\pi(2.0) + \frac{\pi}{3}\right) = -2.7 \times 10^2 \text{ m/s}^2 .$$

(d) In the second paragraph after Eq. 16-3, the textbook defines the phase of the motion. In this case (with $t = 2.0$ s) the phase is $3\pi(2.0) + \frac{\pi}{3} \approx 20$ rad.

(e) Comparing with Eq. 16-3, we see that $\omega = 3\pi$ rad/s. Therefore, $f = \omega/2\pi = 1.5$ Hz.

(f) The period is the reciprocal of the frequency: $T = 1/f \approx 0.67$ s.