31. Since \( T = 2\pi \sqrt{\frac{m}{k}} \) for a mass-spring system, the period is independent on the gravitational acceleration.

So the answer is [no].

Since \( T = 2\pi \sqrt{\frac{L}{g}} \) for a pendulum, the period depends on the gravitational acceleration. The period actually increases on the Moon due to the smaller gravitational acceleration. The answer is then [yes].

32. (a) \( T = 2\pi \sqrt{\frac{m}{k}} = 2\pi \sqrt{\frac{0.50 \text{ kg}}{200 \text{ N/m}}} = 0.31 \text{ s} \)

(b) \( f = \frac{1}{T} = \frac{1}{0.31 \text{ s}} = 3.2 \text{ Hz} \)

33. (a) \( T = 2\pi \sqrt{\frac{L}{g}} = 2\pi \sqrt{\frac{1 \text{ m}}{9.80 \text{ m/s}^2}} = 2.0 \text{ s} \)

(b) \( f = \frac{1}{T} = \frac{1}{2.0 \text{ s}} = 0.50 \text{ Hz} \)

34. \( T = 2\pi \sqrt{\frac{m}{k}} \) \( \Rightarrow \) \( m = \frac{T^2 k}{4\pi^2} = \frac{(2.0 \text{ s})^2 (100 \text{ N/m})}{4\pi^2} = 10 \text{ kg} \)

35. \( T = 2\pi \sqrt{\frac{L}{g}} \) \( \Rightarrow \) \( L = \frac{T^2 g}{4\pi^2} = \frac{(1.0 \text{ s})^2 (9.80 \text{ m/s}^2)}{4\pi} = 0.25 \text{ m} \)

36. (a) The position right after the push is positive and the initial position is zero. So \( x = 4 \sin \omega t \).

(b) The initial position is at \( x = A \). So \( x = A \cos \omega t \).

37. (a) Compare to \( y = A \sin \omega t \). \( A = 0.10 \text{ m} \).

(b) \( \omega = 2\pi f = 100 \text{ rad/s} \) \( \Rightarrow \) \( f = \frac{100}{2\pi} = 16 \text{ Hz} \)

(c) \( T = \frac{1}{f} = \frac{1}{16 \text{ Hz}} = 0.063 \text{ s} \).

38. (a) Compare to \( y = A \sin 2\pi ft \). \( A = 5.0 \text{ cm} \).

(b) \( \omega = 2\pi f = 20\pi \text{ rad/s} \) \( \Rightarrow \) \( f = 10 \text{ Hz} \).

(c) \( T = \frac{1}{f} = \frac{1}{10 \text{ Hz}} = 0.10 \text{ s} \).