$x(t) = A\cos(\omega t)$ .05kg

3. **~KJF2nd 14-19** The position as a function of time t of a 50.0 g mass attached to a spring is given by

$$x(t) = (2.00\text{ cm})\cos\left\{\left(10.0\ \frac{\text{rad}}{\text{s}}\right)\cdot t\right\}$$

A = 0.02m
ω = 10 rad/s
M = 0.05kg

a) What is the amplitude (maximum displacement) of the motion?
b) What is the period? *{0.628 s}*
c) What is the spring constant? *{5.00 kg/s²}*
d) What is the total mechanical energy? *{1.00 mJ}*
e) Determine the position at t = 0.400 s. *{-1.31 cm}*
f) What is the maximum speed?
g) Determine the velocity at t = 0.400 s. *{15.1 cm/s}*
h) What is the potential energy stored in the spring at time t = 0.400 s? *{0.427 mJ}*
i) What is the kinetic energy at time t = 0.400 s?
j) What is the total energy at time t = 0.400 s?

(a) 0.02m (b) 0.628s (c) 5.006 kg/s² (d) 0.001J (e) −1.31 cm
(f) 20cm/s (g) 15.1cm/s (h) .427mJ (i) 4.27mJ (j) 0.432mJ

$T = \omega 2\pi = 0.6283185307$ $\Sigma E = \frac{1}{2}kA^2 = .001$

$T = 2\pi\sqrt{\frac{m}{k}}$ $k = \left(\frac{T}{2\pi}\right)^2 m = 4.9919317$ $x(.4) = (.02)\cos(10 \cdot 0.4) = -0.013072824$ m

$m\left(\sqrt{\frac{m}{k}} = \frac{T}{2\pi}\right)^2$ $V_{max} = \pm A\sqrt{\frac{k}{m}} = (.02)\sqrt{\frac{(5)}{(.05)}} = 0.2$ m/s

$v(t) = -\omega A\sin(\omega t) = -(10)(0.02)\sin(10 \cdot 0.4) = 0.15136049991$

$U_{sp} = \frac{1}{2}kx^2 = \frac{(5)(-0.013)^2}{2} = 0.000427249558$ $\Sigma E = U + K = 0.000431522455$

$K = \frac{1}{2}MV^2 = \frac{(0.05)(-0.013)^2}{2} = 0.000004274999558$