9) 0.60 kg mass; vibrates 3.0 times/s; amplitude of 0.13 m

a) velocity @ eq = 2.48 m/s

b) velocity 0.10 m from eq = 1.56 m/s

c) total energy of system = 1.85 J

d) equation describing the motion of the mass, assuming x_{max} @ $t=0$ = ~~A~~

Find K $T = 2\pi\sqrt{m/K}$ $\frac{T}{2\pi} = \sqrt{m/K}$ $\frac{T^2}{4\pi^2} = m/K$

$K(T^2/4\pi^2) = m$ $K = m/T^2/4\pi^2$ $= K = \frac{4\pi^2 m}{T^2}$

$K = \frac{4\pi^2(0.60kg)}{0.33s^2}$ → 217.51

$V_{max} = A\sqrt{K/m}$ → $V_{max} = 0.13m\sqrt{217.51/0.60kg}$

$= 2.48$

$E = \frac{1}{2}mv^2_{max}$ → $E = \frac{1}{2}(.60kg)(2.48)^2$

$= 1.85$ J

$v = \sqrt{\frac{kA^2 - kx^2}{m}}$ $v = \sqrt{\frac{(217.51)(.13m)^2 - (217.51)(.10m)^2}{0.60}}$

$E =$

$= 5.00$

$E = \frac{1}{2}kx^2 + \frac{1}{2}mv^2 = \frac{1}{2}(217.51)(.13^2) + \frac{1}{2}(.60kg)(2.48^2)$

$= 3.68$

$v = v_{max}\sqrt{1 - x^2/A^2} = 2.48\sqrt{1 - \frac{.10^2}{.13}} = 1.58$

~~A~~ (d) $x = A\cos(\omega t)$?

$x = (.13)\cos(2\pi(3)t)$

10) @ what displacement from eq is the speed of a SHO half the max value?

$\frac{1}{2}kA^2 = \frac{1}{2}m\left(\frac{v_{max}}{2}\right)^2 + \frac{1}{2}kx^2$ $\quad v_{max} = A\sqrt{k/m}$

$\frac{1}{2}kA^2 = \frac{1}{2}m\left(\frac{A\sqrt{k/m}}{2}\right)^2 + \frac{1}{2}kx^2$

$\frac{1}{2}kA^2 = \frac{1}{2}m\left(\frac{kA^2}{4m}\right) + \frac{1}{2}kx^2$

$\frac{1}{2}kA^2 = \frac{kA^2}{8} + \frac{1}{2}kx^2$ $\cdot 8$

$4kA^2 = kA^2 + 4kx^2$

$-kA^2 \quad -kA^2$

$\frac{3kA^2}{4k} = \frac{4kx^2}{4k}$

$\frac{3}{4}A^2 = x^2$

$x = \sqrt{\frac{3}{2}}A$