Physics 111-01
Test 3
November 20, 1998

Name:_____

Usual Seat #_____

Be sure to show your work **clearly** and **draw a box around your answer**. If any question is unclear, please ask immediately. All answers must have the correct units.

1. (30 pts.) A 0.120 kg mass is attached to a horizontal spring and oscillates over a horizontal frictionless surface with a period of 0.75 s. The relaxed position of the spring is at the origin. The mass is pulled a distance 0.6m to the right and released from rest.

  a. (10 pts.) What is the spring constant?

  b. (20 pts.) What is the speed of the mass when $x = -0.3$ m?

Name: $SOLUTIONS$

Usual Seat #____

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a. $T = 2\pi\sqrt{m/k} \Rightarrow k = \dfrac{4\pi^2}{T^2}m = \dfrac{4\pi^2}{(0.75)^2}(.120) =$

$$\boxed{k = 8.422 \, N/m}$$

b. $E_i = E_f$

$U_i + K_i = U_f + K_f$

$\frac{1}{2}kA^2 + 0 = \frac{1}{2}k x_f^2 + \frac{1}{2}m N_f^2$

$N_f^2 = \dfrac{(kA^2 - kx_f^2)}{m} = \dfrac{k}{m}(A^2 - x_f^2) = \dfrac{8.422}{0.12}\left(.6^2 - (-.3)^2\right)$

$N_f^2 = 18.95 \, m/s$

$$\boxed{N_f = 4.35 \, m/s}$$

Note: can't use $F = ma$ and kinematics from ch. 2 since a is not constant.