Spring Practice Problem

1. a) $x = 0.4m$

$$F_{Spring} = kx = 60N/m(0.4m) = 24N$$

b) $PE_{Spring} = \frac{1}{2}kx^2 = \frac{1}{2}(60N/m)(0.4m)^2 = 4.8J$

2. a) $x = 2.15m - 2m = 0.15m$

$$F_{Spring} = kx = 50N/m(0.15m) = 7.5N$$

b) $PE_{Spring} = \frac{1}{2}kx^2 = \frac{1}{2}(50N/m)(0.15m)^2 = 0.563J$

3. a) Energy was not conserved. The system had less energy (0.563 J vs 4.8 J) at the end.

b) Left edge started at 0m and stopped at 1.8m, Distance = 1.8m

c) $PE_A + KE_A + W_{NC} = PE_C + KE_C$

$W = Fd$

$4.8J + 0 + F_{Frict}(1.8m) = 0.563J + 0$

$4.24J = -F_{Frict}(1.8m)$

$F_{Frict} = -2.351N$

$F_{Spring} = -kx$

4.

a)

$$PE_A + KE_A + W_{NC} = PE_B + KE_B$$

$$4.8\,J + 0 + F_{fr}\,d = 0 + KE_B$$

$F_{fr} = -2.35\,N$ ↑ ; 1.3 m (from 0 m to 1.3 m) ↑

$$4.8\,J + (-2.35\,N)(1.3\,m) = KE_B$$

$$KE_B = 1.74\,J$$

b) $KE_B = \frac{1}{2}mv^2$

$$1.74\,J = \frac{1}{2}(4\,kg)v^2$$

$$v = 0.933\,m/s$$