Phy 107

HW 4 solution

September 17, 2020

Problem 1

a) $Fdcos(30°) = 0.87Fd \rightarrow$ *positive W*
b) $Fdcos(100°) = -0.17Fd \rightarrow$ *negative W*
c) $\overrightarrow{F}.\overrightarrow{d} = -8 \rightarrow$ *negative W*

Problem 2

Apply Work-Kinetic Energy Theorem: $\Delta K = W$
$11 - 20 = \int_0^3 F(x)dx$
$-9 = \int_0^3 cx - 3x^2 dx$
$-9 = (\frac{cx^2}{2} - x^3)\Big|_0^3$
$-9 = c\frac{9}{2} - 3^3 \rightarrow c = 4$

Problem 3

Elastic Potential Energy $= \frac{1}{2}kx^2$
$25 = \frac{1}{2}k(7.5/100)^2$
$k = 8889\ N/m$

Problem 4

$E_{mec} = 12 + 4 = 16\ J$
a) x= 3.5 cm
$U = 9\ J \rightarrow K = E_{mec} - U = 7$
$K = \frac{1}{2}mv^2$

b) x = 6.5
$U = 0\ J \rightarrow K = E_{mec} - U = 16$
$K = \frac{1}{2}mv^2$

c) $\frac{0-24}{7-8} = \frac{0-16}{7-x_R} \rightarrow x_R = 7.67$

d) $\frac{20-9}{1-3} = \frac{20-16}{1-x_L} \rightarrow x_L = 1.73$

Problem 5

a) $W = Fdcos(\theta) = 7.68(4.06)cos(15) = 30.12\ J$

b) $W = \Delta K + \Delta U + \Delta E_{th}$
$W = 0 + 0 + \Delta E_{th}$

c) $F_N + Fsin(\theta) = mg \rightarrow F_N = 33.03\ N$
$Fcos(\theta) - f_k = ma = m(0) = 0 \rightarrow f_k = 7.42\ N$
$f_k = \mu_k F_N \rightarrow \mu_k = 0.225\ N$