Physics 131.01 Monday October 11, 2010 Quiz number 4

Cooperative Learning: work together, and submit one solution to each problem. A "solution" is not just a number. The reasoning needs to be indicated. The units of the number need to be specified. If the answer is a vector, the vector needs to be specified. Magnitude alone is not usually enough. **Write all 3 names on each page you submit.**

1. **Circular motion.**

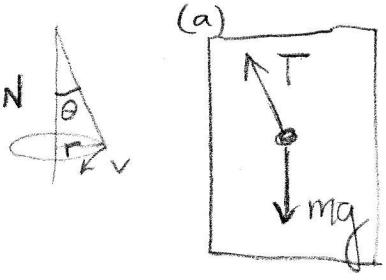
A mass m = 0.40 kg hangs from a string suspended at a point. The string makes an angle θ with respect to the vertical. The mass is moving at speed 1.20 m/s in a circle of radius r = 0.20 m.

a. Draw the free body diagram for the mass.

b. What is the vertical component of the tension in the string? (b) $mg = 3.9\,N$

c. What is the horizontal component of the tension in the string? (c) $\frac{mv^2}{r} = 2.9\,N$

d. What is the angle θ? (d) $\tan^{-1}\frac{2.9}{3.9} = 37°$



2. **Work.**

A 320 kg piano slides 5.0 m down a frictionless ramp with an angle θ (relative to horizontal) of 14 degrees. Someone is pushing upwards along the ramp to keep the speed constant at 0.15 m/s.

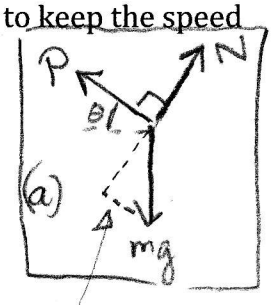
call pushing force P

a. Draw the free body diagram for the piano.

b. How much total work is done on the piano?

c. How much work does gravity do?

d. How much work does the person do?



(b) $KE_f = KE_i$ so $W_{tot} = 0$

(c) $W_{grav} = +(mg\sin\theta)\cdot d \doteq 3800\,J$

(d) $W_{person} = -3800\,J$

$mg\sin\theta$