

# Physics Homework #6

## 6.1. Sliding a hockey puck on slope

$$v_0 = 10 \text{ km/h} = 2.78 \text{ m/s}$$

$$d_{\text{down}} = 0.81 \text{ m}$$

$$d_{\text{up}} = 0.21 \text{ m}$$

$$m = 0.8 \text{ kg}$$

$$g = 9.81 \text{ m/s}^2$$

Downward motion:

$$\frac{1}{2}mv_0^2 = \mu mg \cos \alpha \cdot d_{\text{up}} - mg \sin \alpha \cdot d_{\text{up}}$$

Upward motion:

$$\frac{1}{2}mv_0^2 = \mu mg \cos \alpha \cdot d_{\text{down}} + mg \sin \alpha \cdot d_{\text{down}}$$

Solution:

$$\mu \approx 1.64$$

$$\alpha \approx -43.9^\circ$$

## 6.2. Mass on spring - how much to compress

Spring energy = friction work, so:

$$\frac{1}{2}kx_0^2 = \mu_{\text{friction}}N \cdot x_0$$

$$x_0 = \frac{2\mu_{\text{friction}}N}{k}$$

## 6.3. PythonL How far does a submarine go?

We have Stoke's law:

$$F_{\text{drag}} = -6\pi\eta Rv$$

Newton's 2nd law:

$$ma = F_{\text{drag}} = -6\pi\eta Rv$$

Rewritten:

$$m \frac{dv}{dt} = -6\pi\eta Rv$$