Physics 11 Unit 2 – Worksheet #3 – Hooke's Law

Key

Name: _____

1. An elastic is stretched 8 cm by a 5 N force.

a) Find the spring constant "k" for the elastic.

$$F = K\Delta L \rightarrow K = \frac{F}{\Delta L} = \frac{5\ N}{8\ cm} = 0.625\ N/cm$$

b) How far would the elastic be stretched by a 7 N force?

$$F = K\Delta L \rightarrow \Delta L = \frac{F}{K} = \frac{7N}{0.625} = 11.2\ cm$$

c) How much force would be required to stretch the elastic 18 cm?

$$F = K\Delta L = (0.625)(18) = 11.25\ N$$

2. A spring is compressed 1.2 cm by a 240 N force. How much force is required to compress the spring 1.5 cm?

① Find K first $K = \frac{F}{\Delta L} = \frac{240}{1.2} = 200\ N/cm$

② $F = K\Delta L = (200\ N/cm)(1.5\ cm) = 300\ N$

3. A wooden ruler Is bent 2.4 cm by a 4.6 N force. How far is the ruler bent by a 6.8 N force?

① Find K $K = \frac{F}{\Delta L} = \frac{4.6}{2.4} = 1.92\ N/cm$

② $\Delta L = \frac{F}{K} = \frac{6.8}{1.92} = 3.54\ cm$,

4. An elastic is stretched 11 cm by a 16 N force.

a) How long is the elastic stretched by a 5 N force?

① $K = \frac{F}{\Delta L} = \frac{16}{11} = 1.454\ N/cm.$

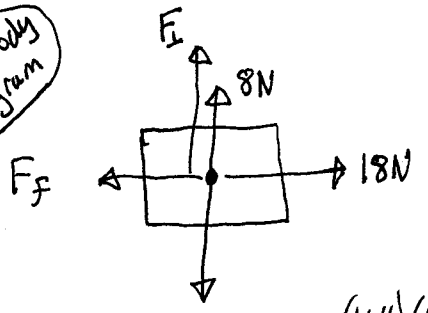
② $\Delta L = \frac{F}{K} = \frac{5}{1.454} = 3.44\ cm$

b) How much force is required to stretch the elastic 17 cm?

$F = K\Delta L = (1.454)(17) = 24.7\ N$

5. A 4.4 kg block is sitting on a table. A string is pulling on the block straight up with a force of 8 N. The block is being pulled to the right with a force of 18 N. The coefficient of friction between the block and the table is 0.4
Does the block move?

Free Body Diagram



① $F_g = mg = (4.4)(9.8) = 43.12\ N$

② $F_{up} = F_{down}$. (assuming no accel up or down)

$F_L + 8 = 43.12$

$F_L = 35.12$

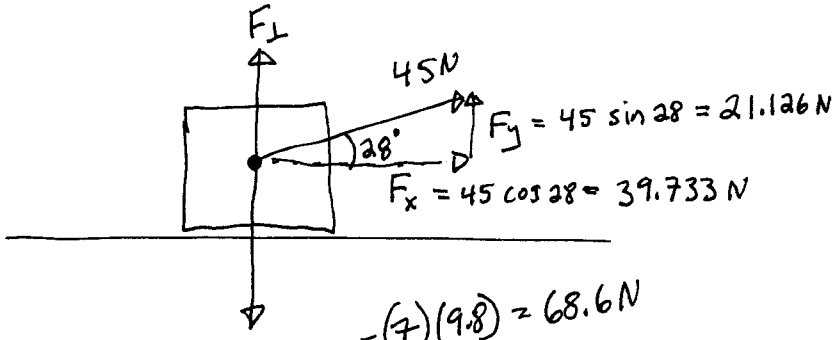
③ $F_{f_{MAX}} = \mu F_L = (.4)(35.12) = 14.048$

④ $F_{applied} > F_{f\,MAX}$, therefore block moves.

and $F_f = F_{f\,MAX}$.

Harder Problem

6. A 7 kg block sits on a table with a coefficient of friction of 0.35
The block is pulled to the right by a force of 45 N at 28 degrees above the horizon.
Does the block move?



① $F_g = mg = (7)(9.8) = 68.6N$

② $F_{up} = F_{down}$

$F_y + F_\perp = F_g$

$F_\perp = F_g - F_y = 68.6 - 21.126 = 47.474$

③ $F_{f_{max}} = \mu F_\perp = (.35)(47.474) = 16.616\,N$

④ $F_{applied}$ (39.7 N) $> F_{f\,MAX}$, therefore block moves

not only does it move it accelerates

⑤ $F_{NET} = F_x - F_f = 39.733 - 16.616 = 23.117\,N$

⑥ $a = \frac{F_{NET}}{m} = \frac{23.117}{7} = 3.30\,m/s^2$.