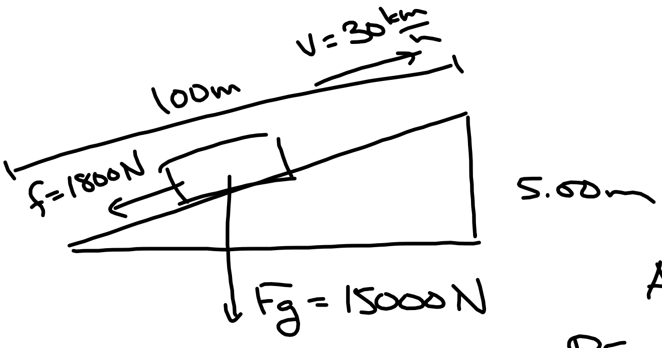


If it goes up 5.00m
and travels 100m...

At bottom	At top
PE = ☺	PE = mgh
$KE = \frac{1}{2}mv^2$	$KE = \frac{1}{2}mv^2$

$$\underbrace{\overset{\text{bottom}}{\overset{☺}{\cancel{PE}}} + \cancel{KE}}_{E_i} + \underbrace{W}_{E_{added}} - \underbrace{W_f}_{E_{lost}} = \underbrace{\overset{\text{top}}{PE} + \cancel{KE}}_{E_f}$$

$$W - fd = mgh$$

$$W - (1800N)(100m) = (15000N)(5.00m)$$

$$W - 180000\,J = 75000\,J$$

$$W = 255000\,J$$

$$P = \frac{W}{t} = \frac{255000\,J}{12\ s}$$

$$= 21250\,W$$

So 21.3 kW

$$d = vt$$

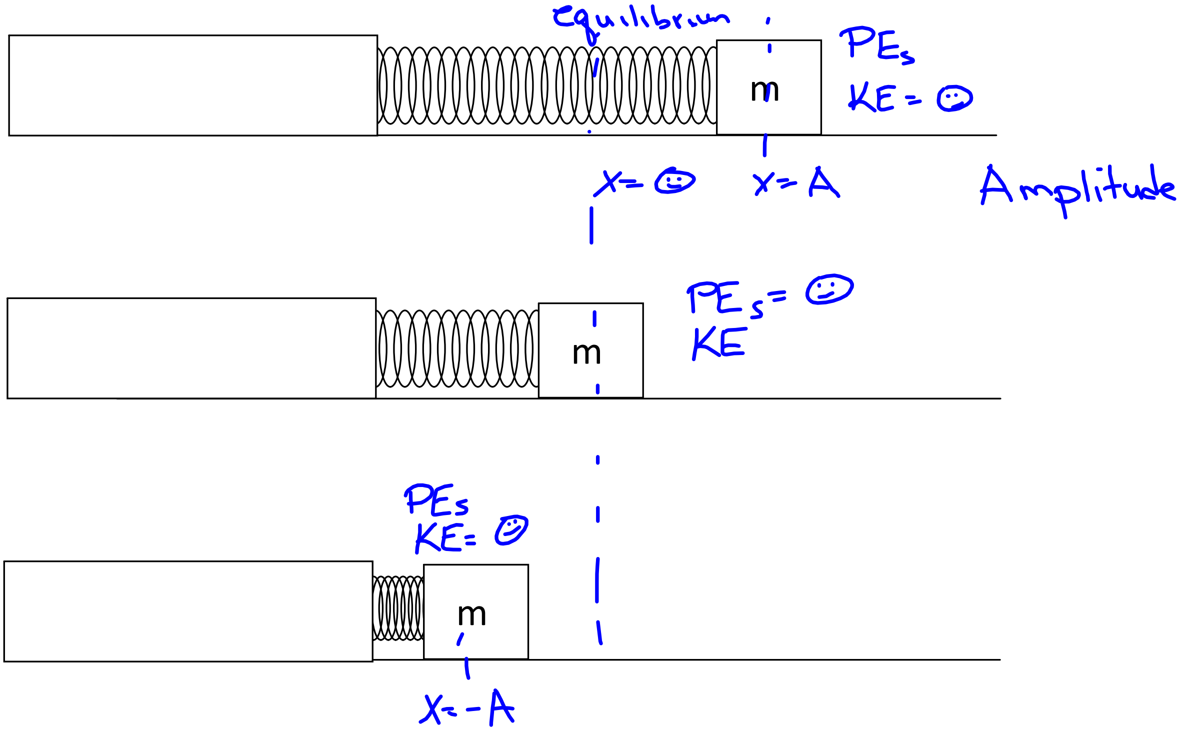
$$100m = (8.3\tfrac{m}{s})t$$

$$t = \underline{12s}$$

$$30\tfrac{km}{h} = \frac{30000m}{3600s}$$

$$= 8.3\tfrac{m}{s}$$

Springs



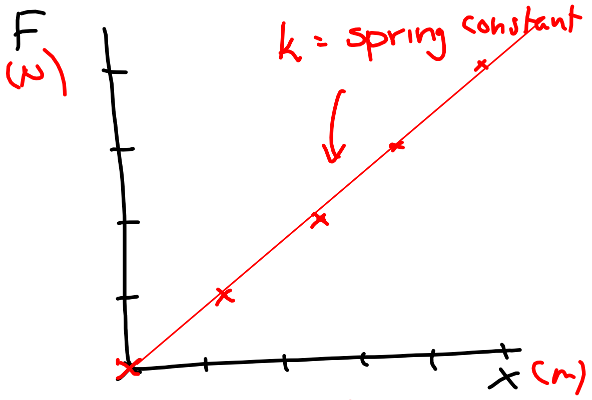
Hooke's Law

When we stretch a spring, the force required to stretch it increases linearly with the size of the stretch.

Let's take some data:

x

length (m)	Stretch (m)	Force (N)	m (g)
0.587	☺	0N	☺
0.717	0.130	0.98N	100g
0.842	0.255	1.96	200g
0.958	0.371	2.94	300g
1.075	0.488	3.92	400g



$k \approx 7.96$ N/m

$y = mx + \cancel{b}$ ☺

$F = kx$

k depends on spring

Bigger k mean stiffer spring (more force need to stretch <u>or</u> compress it)

Hooke's Law Equation

$$\boxed{\vec{F} = -k\vec{x}}$$

↑

Force the spring applies to the object.

$$\vec{F} = k\vec{x}$$

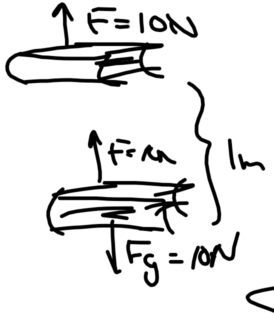
↑

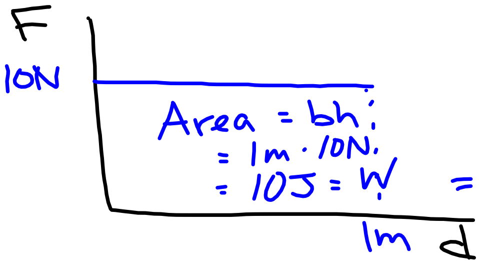
(or compress)

Force to stretch the spring. In same direction as $\vec{x}$ (stretch/compression)

Potential Energy of a Spring

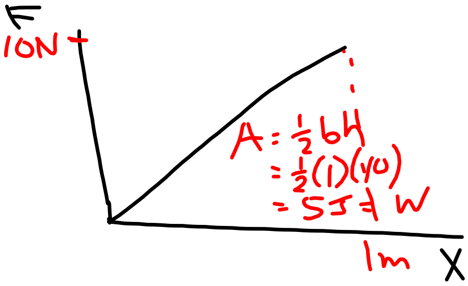
Textbook





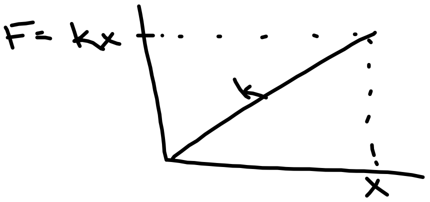
Area = bh
= 1m · 10N
= 10J = W = PE

Spring



$A = \frac{1}{2}bh$
$= \frac{1}{2}(1)(10)$
$= 5J = W$

$W = PE = 5J$



$W = \frac{1}{2}bh$
$= \frac{1}{2}x \cdot kx$

$$\boxed{PE_s = \frac{1}{2}kx^2}$$

Homework

p. 258 # 35, 36

p. 261 # 38, 40