Types of Energy

1. Calculate the height of a 0.500 kg basketball at rest if it has 7.00 J of energy.

GRAVITATIONAL PE

$m = 0.500\text{kg}$, $PE = 7.00\text{J}$, $h = ?$

$PE = mgh \rightarrow h = \frac{PE}{mg} = \frac{7.00\text{J}}{(0.500\text{kg})(7.00\text{J})}$

$h = 1.43\text{m}$

2. A 70.0 kg astronaut is on Planet X. If he has 2.00 x 10^3 J of energy when he is at a height of 5.00 m, what is the acceleration due to gravity on this planet?

$m = 70.0\text{kg}$, $PE = 2.00 \times 10^3\text{J}$, $h = 5.00\text{m}$, $g = ?$

$PE = mgh \rightarrow g = \frac{PE}{mh} = \frac{2.00 \times 10^3\text{J}}{(70.0\text{kg})(5.00\text{m})}$

$g = 5.71\text{m/s}^2$

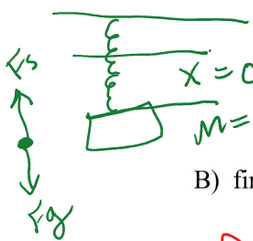
3. What is the mass of a medicine ball that has 50.0 J of energy moving at 4.50 m/s?

$KE = 50.0\text{J}$, $v = 4.50\text{m/s}$, $m = ?$

$KE = \frac{1}{2}mv^2$

$m = \frac{2KE}{v^2} = \frac{2(50.0\text{J})}{(4.50\text{m/s})^2} = 4.94\text{kg}$

4. A spring is held vertically and a 3.00 kg mass stretches the spring 0.500 m.
   A) calculate the spring constant of the spring



$x = 0.500\text{m}$, $K = ?$, $m = 3.00\text{kg}$

$F_s = Kx \rightarrow K = \frac{F_s}{x} = \frac{29.43\text{N}}{0.500\text{m}} = 58.9\text{N/m}$

$F_s = F_g = mg = (3.00\text{kg})(9.81\text{m/s}^2) = 29.43\text{N}$

   B) find the amount of stored elastic potential energy in the spring

$PE_s = \frac{1}{2}Kx^2 = \frac{1}{2}(58.9\text{N/m})(0.500\text{m})^2 = 7.36\text{J}$

5. A spring is stretched from 0.0200 m to 0.0900 m. Find the amount of energy stored in the spring (k = 5.00 N/m).

$PE_s = \frac{1}{2}Kx^2 = \frac{1}{2}(5.00\text{N/m})(0.0700\text{m})^2 = 0.0123\text{J}$

$x = 0.0900\text{m} - 0.0200\text{m} = 0.0700\text{m}$