

$$W = F \cdot d$$

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

$$\text{PE} = mgh$$

$$I = \Delta p = F \cdot t$$

$$P = \frac{W}{t} = \frac{E}{t}$$

1. A 0.5 kg ball falls from a height of 15 m. It rebounds to a height of 12 m:

(a) What impulse did the ground provide in the bounce?

(b) How much energy was lost in the bounce?

2. A google search reveals the mass of the USS Enterprise starship to be  $3.25 \times 10^9$  kg. If the starship is traveling at  $6.0 \times 10^7$  m/s, what impulse is required to double its velocity?

3. A 750 kg car drives a distance of 200 m up a hill at an angle of  $30^\circ$ .
- (a) What is the change in potential energy of the car?
  - (b) How much work did the car do?
  - (c) What force was required to make it up the hill?
4. 45 million gallons of water fall 21.3 meters every minute at Niagara Falls. How much power does this represent? (1 gallon  $\text{H}_2\text{O}$  = 3.79 kg)