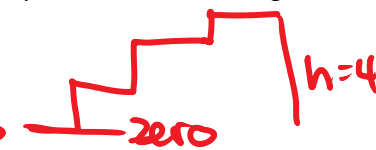# Power Calculations

Wednesday, November 6, 2013   1:16 PM

1. A car is going down a freeway at 40 m/s. It requires 200 N of force to maintain its speed. What is its power?

2. A person is walking up a flight of stairs at a constant velocity. The stairs are 4 m high. IF the mass is 60 kg and the time is 4 s, find the power in W and hp.

$$\Delta Energy \text{ is } PE$$

$$P = \frac{\Delta PE}{t} = \frac{PE_f - PE_i}{t} = \frac{PE_f}{t} = \frac{mgh}{t}$$

($PE_i \to$ zero, zero, $h = 4$)

$$= \frac{60 \cdot 9.8 \cdot 4}{4} = 588 \text{ W}$$

$$588 \text{ W} \left| \frac{1 \text{ hp}}{746 \text{ W}} \right| = 0.788 \text{ hp}$$

3. For a 5 hp motor, how much work can be done in 3 minutes?

$$P = W/t$$

$$W = P \cdot t$$

$$= 3730 \cdot 180$$

$$= 671400 \text{ J}$$

$$5 \text{ hp} \left| \frac{746 \text{ W}}{1 \text{ hp}} \right| = 3730 \text{ W}$$

$$3 \text{ min} \left| \frac{60 \text{ s}}{1 \text{ min}} \right| = 180 \text{ s}$$

4. A car with a mass of 1000 kg accelerates from 20 m/s to 40 m/s in 3 s. Find the power.

$$\Delta KE$$

$$P = \frac{\Delta KE}{t} = \frac{\frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2}{t} = \frac{\frac{1}{2}\cdot 1000 \cdot 40^2 - \frac{1}{2}\cdot 1000 \cdot 20^2}{3}$$

$$= \frac{800000 - 200{,}000}{3} = \frac{600{,}000}{3} = 200{,}000 \text{ W}$$

$$200{,}000 \text{ W} \left| \frac{1 \text{ hp}}{746} \right| = 268 \text{ hp}$$