From a practical viewpoint, not only are we interested in the work done on an object, but also at the rate at which work is being done on the object.

POWER – A measure of the time-rate at which work is done on a system.

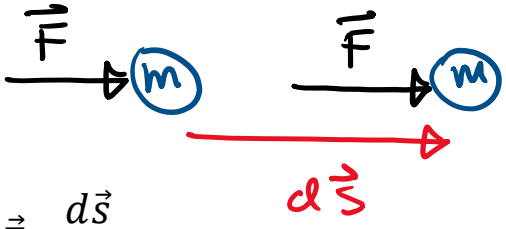
If an amount of work *W* is done on an object in a time interval *t* by a force **F**, then the average power delivered to the object by the force **F** is given by:

$$\boxed{P_{ave} = \frac{W}{t}}$$ Average Power

Often the rate at which work is done on an object varies with time and thus we speak about instantaneous power.

$$\boxed{P = \frac{dW}{dt}}$$ Instantaneous Power

Consider a force **F** acting on a particle over a very small displacement ***ds***. The work done by **F** is given by:



$$dW = \vec{F} \bullet d\vec{s}$$

$$P = \frac{dW}{dt} = \frac{\vec{F} \bullet d\vec{s}}{dt} = \vec{F} \bullet \frac{d\vec{s}}{dt}$$

$\boxed{P = \vec{F} \bullet \vec{v}}$ Instantaneous Power (instantaneous rate at which F does work on particle)

$\boxed{P = Fv\cos\theta}$ Instantaneous Power

In general power is the time-rate of energy transfer to a system by any method:

$$\boxed{P = \frac{dE}{dt}}$$ Power

However, for our purpose we will consider ***work*** to be the method of energy transfer.

Units

The SI unit of power is the watt(W)

1W=1J/s

A common unit of power used in the U.S is the horsepower (hp):

1 hp = 746 W = 0.75 KW