

Work

Basic Formula: $Work = Force \cdot Distance$, $W = F \cdot d$

Ex: A 200 lb box held by a pulley 9 ft. high in the air is pulled by a man on the ground. Calculate the work being done.

$$W = F \cdot d$$

$$W = 200 \cdot 9$$

$$= 1800ft - lbs$$

Work

If an object is moved by a constantly changing force $F(x)$ along a straight line, then the work done by $F(x)$ is:

$$W = \int_a^b F(x)dx$$

*There are a lot of different force formulas (Hookes Law $\rightarrow F = k \cdot d$, Newton's Law of Universal Gravitation)

- Hookes Law- Force required to stretch or compress a spring

F- Force

d- Distance stretched/compressed from its original length

k- Constant of proportionality

$$F = K \cdot d \text{ (i.e. } F(x) = k \cdot x \text{ where } x = d)$$

- Newton's Law of Universal Gravitation

The force $F(x)$ exerted by gravity (where x is the distance from the center of the earth) is:

$$F(x) = \frac{C}{x^2}$$

NOTES:

1. C is a constant determined by the weight of the object
2. You can assume 4,000 miles for the radius of the Earth
3. 5,280 feet = 1 mile
2,000 lbs = 1 ton

Ex:

$$F(4000) = \frac{C}{4000^2}$$

$$185 = \frac{C}{4000^2}$$

$$C \approx 2.96 \times 10^9$$

$$\text{So, } F(x) = \frac{2.96 \times 10^9}{x^2}$$