

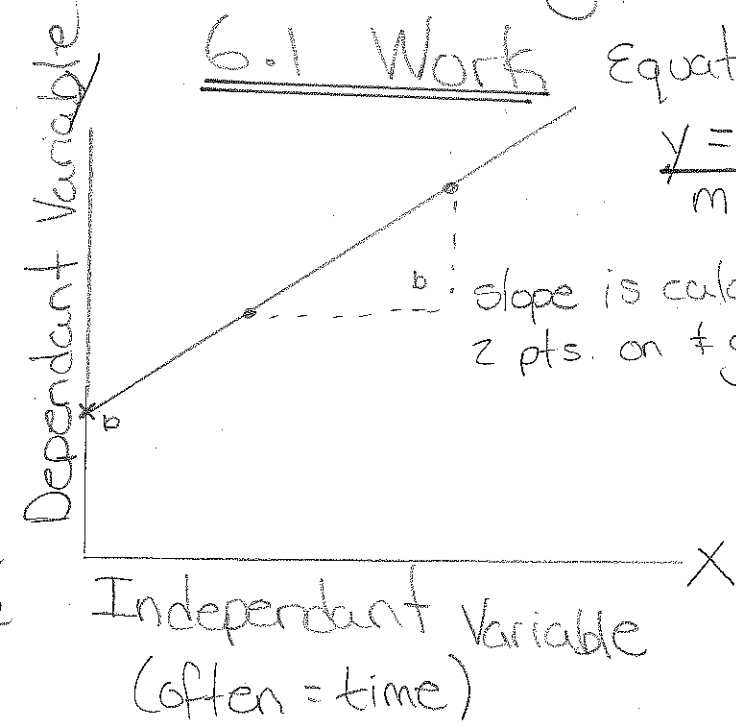
Physics II
Unit 6 Energy

6.1 Work

Equation of a line

$$y = mx + b$$

$m = \text{slope}$ $b = y\text{-intercept}$



slope is calculated from 2 pts. on a graph $\frac{\text{rise } \Delta y}{\text{run } \Delta x}$

Review

Graphs

• visual representations of data

slope: in a time graph a slope is a rate of change

New

Do you know the meaning of work?

Energy is the ability to do work...

Work: "release of energy to complete a task" C.J.

If work is to be done

a) a force must act on the object

b) the object must move in the direction of the force

$$W = F \cdot d$$

work = force · distance

Work Units: $W = Fd$
 $N \cdot m$

Units: $N [kg \cdot m/s^2]$
 d units: m

$1 N \cdot m = 1 \text{ Joule (J)}$

Power \rightarrow \neq ability to do work over a period of time

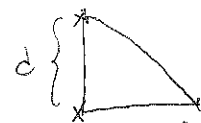
$P = \frac{W}{\Delta t} = \frac{J}{s} \therefore$ units of power = $\frac{J}{s}$

but $1 \frac{J}{s} = 1 \text{ Watt}$

\rightarrow Power can also be measured in \neq non-metric unit of horsepower. James Watt designed a steam engine to pump H_2O out of coal mines; work that was previously done by horses. People wanted to know how many horses \neq engine could replace.....

Watt calculated that
 $1 \text{ horsepower} = \frac{550 \text{ footpounds}}{\text{second}} = 746 \text{ Watts}$

Practice



1) How much work is done by a 70 kg person climbing stairs 25.0 m high [moving at a steady pace]

$m = 70 \text{ kg}$

$F_g = (70 \text{ kg})(9.8 \text{ m/s}^2)$
 $= 686.7 \text{ N}$

$d = 25.0 \text{ m}$



$W = Fd$

$W = (686.7)(25.0)$

$W = 17167.5 \text{ J}$

$W = 17000 \text{ J}$

17 kJ

$1.7 \times 10^4 \text{ J}$

2) How much work [or energy] in (J) does a 150 W lightbulb convert to heat and light in 1.0 hour?

$P = \frac{W}{\Delta t} \rightarrow P \Delta t = W$

$P = 150 \text{ W} (\frac{J}{s})$

$\Delta t = 3600 \text{ s}$

$W = (150 \frac{J}{s})(3600 \text{ s})$

$W = 540,000 \text{ J}$

540 kJ

$5.4 \times 10^5 \text{ J}$