$$F = ma$$

$$V_f^2 = V_i^2 + 2ad$$

$$V_f^2 - V_i^2 = 2ad$$

$$\frac{V_f^2 - V_i^2}{2d} = a$$

$$F = m\left(\frac{V_f^2 - V_i^2}{2d}\right)$$

$$F \cdot d = m\frac{1}{2}\left(V_f^2 - V_i^2\right)$$

$$\underbrace{F \cdot d}_{\text{Work}} = \underbrace{\frac{1}{2}mV_f^2 - \frac{1}{2}mV_i^2}_{\Delta K}$$

Now: $F = ma$

$a \to \frac{dv}{dt}$

$F = m\frac{dv}{dt}$

$F = \frac{d(mv)}{dt}$ → momentum = $\vec{p}$

$p = mv$

$$F = \frac{dp}{dt}$$

$$F = \frac{\Delta p}{\Delta t} = \frac{p_f - p_i}{t_f - t_i}$$

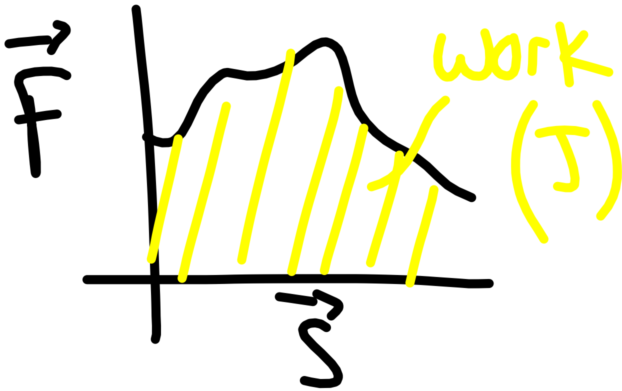
$$F = \frac{p_f - p_i}{t_f - t_i}$$

$$F(t_f - t_i) = p_f - p_i$$

Impulse (J) ← $\boxed{F\Delta t} = \Delta p$

Work = change in energy

Impulse = change in momentum



$$W = \int F(s)\, ds$$

$$J = \int F(t)\, dt$$

Lessons:

momentum is:

- a vector

$P_1 = 3.0 \text{ cn}$

$P_2 = -4.0 \text{ cn}$

$P_t = -1.0 \text{ cn}$

$\left(\frac{kg \cdot m}{s}\right)$

- Conserved

$P_i = P_f$

$$J = \Delta p = F\Delta t$$

<u>or</u>: $m\Delta v = F\Delta t$

↑ assumes F = constant (F)

↑ assumes m = constant (m)

Ex: Ⓐ 0.50 kg and 4.0 $\frac{m}{s}$

Ⓑ 0.10 kg and 20.0 $\frac{m}{s}$

K	P
Ⓐ $\frac{1}{2}mv^2 = \frac{1}{2}(.5)(4)^2$ 4.0 J	$mv = (.5)(4) = 2.0$ Cn
Ⓑ $\frac{1}{2}mv^2 = \frac{1}{2}(.1)(20)^2 =$ 20.0 J	$mv = (.1)(20) = 2.0$ Cn

$F = ma$

$F = \frac{dp}{dt}$