Work-Energy Theorm.

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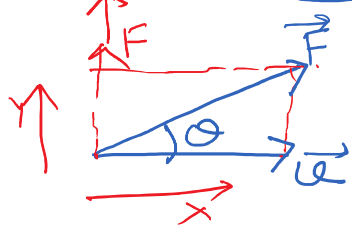
$$\boxed{K(v) = \frac{1}{2} m v^2 = \frac{1}{2} m \vec{v}\cdot\vec{v}}$$

$$\frac{dK}{dt} = \frac{d}{dt}\left(\frac{1}{2} m v^2\right)$$

$$\frac{dK}{dt} = m v \frac{dv}{dt} = m a v = \boxed{F_t v}$$

$\uparrow a$



$F_t = F_x$ & $F_v = F_y$

Work done

↳ Component of F along the direction of displacement

F_t

$F_x = F\cos\theta \qquad F_y = F\sin\theta \Rightarrow F_t = F\cos\theta$

$\Rightarrow \dfrac{dk}{dt} = F\cos\theta\, v = \vec{F}\cdot\vec{v}$

$\boxed{\vec{v} = \dfrac{d\vec{r}}{dt}}$

$$\boxed{\frac{dk}{dt} = \frac{\vec{F}\cdot d\vec{r}}{dt}}$$

$$\boxed{dk = \vec{F}\cdot d\vec{r}} \quad \text{——} \quad (1)$$

Work done

$W = \int \vec{F}\cdot d\vec{r} \Rightarrow \int dk = \int \vec{F}\cdot d\vec{r} \Rightarrow \boxed{W = K_2 - K_1}$

Multiple force on a particle

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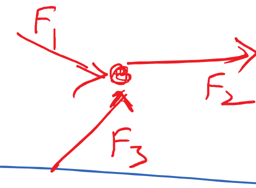
⇒ Suppose N number of forces are working on a particle.



$$\boxed{W = \int \vec{F_1}\cdot d\vec{r} + \int \vec{F_2}\cdot d\vec{r} + \int \vec{F_3}\cdot d\vec{r} - - - - - - + \int \vec{F_N}\cdot d\vec{r}}$$

$$\boxed{P = \frac{dW}{dt}} = \vec{F}\cdot\frac{d\vec{r}}{dt} = \vec{F}\cdot\vec{v}$$