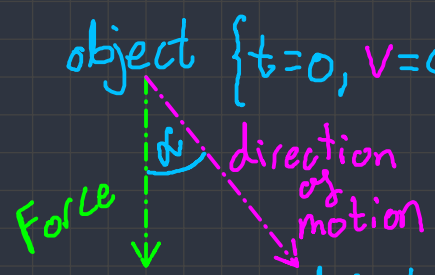
Work done:

The work done is equal to the product of the force and the distance travelled in the same direction of the force.

Work done = force × distance in direction of force

$W = F \times s \times \cos(\alpha)$ ← where α is the angle between the direction of force and the direction of motion.



object {t=t, ke = ← variable with time

$V = \frac{ds}{dt}$

$W_t = |\underset{\sim}{F}| \times |\underset{\sim}{s}| \times \cos(\alpha_t)$

$= |\underset{\sim}{F}| \times |\underset{\sim}{s}| \times \frac{|\underset{\sim}{F} \cdot (\underset{\sim}{u} + \underset{\sim}{F}\frac{t}{m})|}{|\underset{\sim}{F}|\,|\underset{\sim}{u} + \underset{\sim}{F}\frac{t}{m}|}$

$\alpha_t = \arccos\left(\frac{|\underset{\sim}{F} \cdot \underset{\sim}{V_t}|}{|\underset{\sim}{F}|\,|\underset{\sim}{V_t}|}\right)$ → where $\underset{\sim}{F}$ is force vector and $\underset{\sim}{V_t}$ is velocity vector

↳ force vector is constant ∴ velocity vector isn't

$\underset{\sim}{V_t} = \underset{\sim}{u} + \underset{\sim}{F}\frac{t}{m} \rightsquigarrow \frac{\underset{\sim}{F}}{m} = \underset{\sim}{a}$

$$\cos(\alpha) = \frac{|\underset{\sim}{F} \cdot (\underset{\sim}{u} + \underset{\sim}{F}\frac{t}{m})|}{|\underset{\sim}{F}|\,|\underset{\sim}{u} + \underset{\sim}{F}\frac{t}{m}|}$$

$$|\underset{\sim}{F}| \times |\underset{\sim}{s}| \times \int_0^t \left(\frac{\underset{\sim}{F} \cdot (\underset{\sim}{u} + \underset{\sim}{F}\frac{t}{m})}{|\underset{\sim}{F}|\,|\underset{\sim}{u} + \underset{\sim}{F}\frac{t}{m}|}\right) dt = ke$$