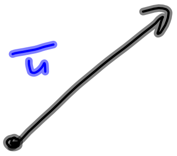
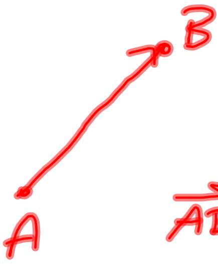
$$ds = \sqrt{x_t^2 + y_t^2 + z_t^2}\; dt$$

$$= |\bar{r}'(t)|\, dt$$

work = (Force)(Distance)

$\bar{F}$,

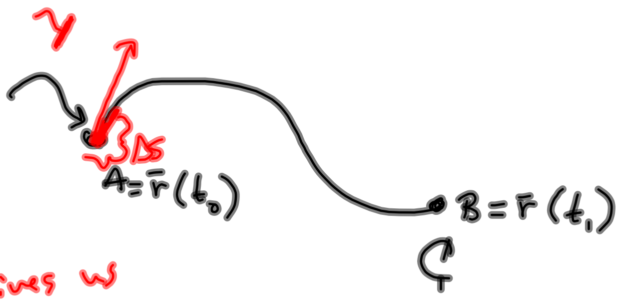




$\overrightarrow{AB} = \bar{u}$

$$\text{work} = \bar{F} \cdot \bar{u}$$

$\bar{T}$



Gives us direction & Δs is length

Work done on the segment from $\bar{r}(t_0)$ to $\bar{r}(t_1)$ is

$$\sum \bar{F} \cdot \bar{T}\, \Delta s = \int_C \bar{F} \cdot \bar{T}\, ds$$

$$\bar{F} \cdot \bar{u}$$

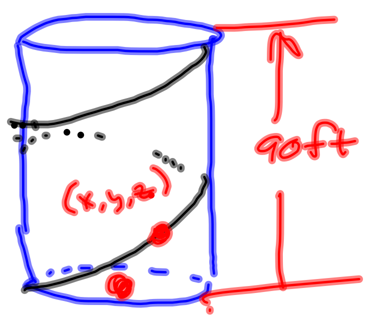
$$= \int_C \bar{F} \cdot \frac{\bar{r}'}{|\bar{r}'|} \cdot |\bar{r}'(t)|\, dt$$

$$= \int_C \bar{F}\, \bar{r}'\, dt$$

$$\int \bar{F}(\bar{r}(t)) \cdot \bar{r}'(t)\, dt$$

#43 $r = 20\text{ ft}$

Weighs 160 lbs
Bucket 25 lbs
185 lbs



3 turns to the top

How much work was done?

$0 \le \theta \le 6\pi$ θ is the parameter

$\bar{F} = \langle 0, 0, 185 \rangle$

$x = r\cos\theta$

$y = r\sin\theta$

$\bar{r}(\theta) = \langle 20\cos\theta, 20\sin\theta, \frac{15}{\pi}\theta \rangle$

$(0,0), (6\pi, 90)$

$m = \frac{90}{6\pi} = \frac{15}{\pi}$

$z = \frac{15}{\pi}(\theta - 0) + 0 = \frac{15}{\pi}\theta$

$y = m(x - x_1) + y_1$

$$\int_C \bar{F}(\bar{r}(\theta)) \cdot \bar{r}'(\theta)\, d\theta$$

work is the line integral wrt arclength of the tangential component of the force.

$$\int_C \overline{F} \cdot \overline{r}' \qquad (0, 185), (6\pi, 176)$$

$$= \int_0^{6\pi} \langle 0, 0, 185 \rangle \cdot \langle 20\cos\theta, 20\sin\theta, \tfrac{15}{\pi}\theta \rangle' \, d\theta$$

forgot the derivative

$$= \int_0^{6\pi} \langle 0, 0, 185 \rangle \cdot \langle -20\sin\theta, 20\cos\theta, \tfrac{15}{\pi} \rangle \, d\theta$$

$$= \int_0^{6\pi} (185)\left(\tfrac{15}{\pi}\right) d\theta$$

$$= \frac{(185)(15)}{\pi} \theta \Big]_0^{6\pi} = \frac{(185)(15)}{\pi}(6\pi)$$

$$= (185)(15)(6) = 16,650 \text{ ft-lbs}.$$

$$= 185 \text{ lbs} \cdot 90 \text{ ft} =$$