- The vector Line Integral of a vector function $\mathbf{F}$ along a curve $\mathbf{r(t)}, a \leq t \leq b$ is $\int_a^b \mathbf{F}(\mathbf{r(t)}) \cdot \frac{\mathbf{r'}(t)}{|\mathbf{r'(t)}|} \mid \mathbf{r'(t)} \mid dt$.

- The above can be shortened to simply

$$\int_a^b \mathbf{F}(\mathbf{r(t)}) \cdot \mathbf{r'(t)} dt$$

- The $\frac{\mathbf{r'}(t)}{|\mathbf{r'(t)}|}$ takes into account that we only care about the direction of the force tangent to the curve.

- The $\mid \mathbf{r'(t)} \mid dt$. Takes into account that our speed may not be 1.

- The work done by a force $\mathbf{F}$ on a particle moving along a curve parametrized by $\mathbf{r(t)}$ is the vector line integral of $\mathbf{F}$ along the path $\mathbf{r}(t)$.