Arc Length

- If one thinks of a curve as the path of a car driving along, the arc length is what the odometer reads.

- We generally use s to stand for arc length

- $\mid \mathbf{r}'(t) \mid = \frac{ds}{dt}$.

- $s(T) = \int_0^T \mid \mathbf{r}'(t) \mid dt$.

- We often wish to reparametrize a curve in terms of s, in which case we use the following recipe:

  − find $\mid \mathbf{r}'(t) \mid$

- Calculate $s(T)$ for an arbitrary choice of T

- Massage the answer to get T in terms of s [rather than s in terms of T.

- Since T can be any number non-negative value the above actually gives a formula for t in terms of s.

- substitute this formula into the formula for $\mathbf{r}(t)$ to get a formula $\mathbf{r}(s)$ for $\mathbf{r}$ in terms of s.