13.3 Arc Length and Curvature

Some Formulas

Curvature

$$\kappa = \left|rac{\mathbf{T}}{ds}
ight| = rac{\left|\mathbf{T}'
ight|}{\left|\mathbf{r}'
ight|} = rac{\left|\mathbf{r}' imes\mathbf{r}''
ight|}{\left|\mathbf{r}'
ight|^3} = rac{\left|f''(x)
ight|}{\left[1+\left(f'(x)
ight)^2
ight]^{3/2}}$$

The Normal and Binormal Vectors

$$\mathbf{T} = rac{\mathbf{r}'}{|\mathbf{r}'|}$$
 $\mathbf{N} = rac{\mathbf{T}'}{|\mathbf{T}'|}$ $\mathbf{B} = \mathbf{T} imes \mathbf{N}$

Torsion

$$au = -rac{d\mathbf{B}}{ds}\cdot\mathbf{N} = -rac{\mathbf{B}'\cdot\mathbf{N}}{\left|\mathbf{r}'
ight|} = rac{\left[\mathbf{r}' imes\mathbf{r}''
ight]\cdot\mathbf{r}'''}{\left|\mathbf{r}' imes\mathbf{r}''
ight|^2}$$