

Differentiation Rules For Vector Calculus

- Are exact analogs to differentiation rules for regular functions.
- A nice illustration of the strength of these rules is what we are calling "Bucky's Theorem:" $|r(t)|$ is constant exactly when $\mathbf{r}(t) \cdot \mathbf{r}'(t) = 0$.

Curvature

- Formally equal to $|\frac{d\mathbf{T}}{ds}|$
- Is also equal by chain rule to $|\frac{d\mathbf{T}'}{dr'}|$ and by product rule to $|\frac{\mathbf{r}' \times \mathbf{r}''}{r'^3}|$.

- This last equation is particularly useful, as it gives the curvature in terms of only $\mathbf{r}(t)$ and its derivatives.
- The curvature is the reciprocal of the radius of the circle that approximates the curve locally.