Formulas & Definitions: Section 13-3

Definition: Length of the curve is

$$L = \int_a^b \sqrt{(dx/dt)^2 + (dy/dt)^2 + (dz/dt)^2}\, dt = \int_a^b |r'(t)|\, dt.$$

Definition: The arc length function s is given by

$$s(t) = \int_a^t |r'(u)|\, du = \int_a^t \sqrt{(dx/du)^2 + (dy/du)^2 + (dz/du)^2}\, du.$$

Formulas: for unit tangent, unit normal and binormal vectors, and curvature

$$T(t) = \frac{r'(t)}{|r'(t)|}, \quad N(t) = \frac{T'(t)}{|T'(t)|}, \quad B(t) = T(t) \times N(t),$$

$$\kappa = |dT/ds| = \frac{|T'(t)|}{|r'(t)|} = \frac{|r'(t) \times r''(t)|}{|r'(t)|^3}.$$