Section 11.8, Arc Length

These is a short section that gives a few methods for computing the arc length of space curves.

Read Lesson 7 in the study guide

Read Section 11.8 in the text.

Suggested Problems: 7, 11, 15, 19, 21, 27, 29

Arc Length

Arc Length:
If $\mathbf{r}(t) = \langle f(t), g(t), h(t) \rangle$ is a space curve, the arc length of the curve from $t = a$ to $t = b$ is

$$arclength = \int_a^b |\mathbf{r}'(t)|dt = \int_a^b |\mathbf{v}(t)|dt =$$

$$\int_a^b \sqrt{(f'(t))^2 + (g'(t))^2 + (h'(t))^2}dt$$

Arc Length and Speed

Arc Length: $s(t) = \int_{t_0}^{t} |\mathbf{v}(u)|\, du$

Note: $\dfrac{ds}{dt} = |\mathbf{v}(t)| =$ speed.

Arc Length for a curve $y = f(x)$ in the plane:

Arc Length in Polar form:

Polar Form: If a curve in the plane is given in polar form, $r = f(\theta)$, then the arc length of the curve from $\theta = a$ to $theta = b$ is given by

$$arclength = \int_a^b \sqrt{((f(\theta))^2 + (f'(\theta))^2}d\theta =$$

$$\int_a^b \sqrt{\left(\frac{dx}{d\theta}\right)^2 + \left(\frac{dy}{d\theta}\right)^2}d\theta$$