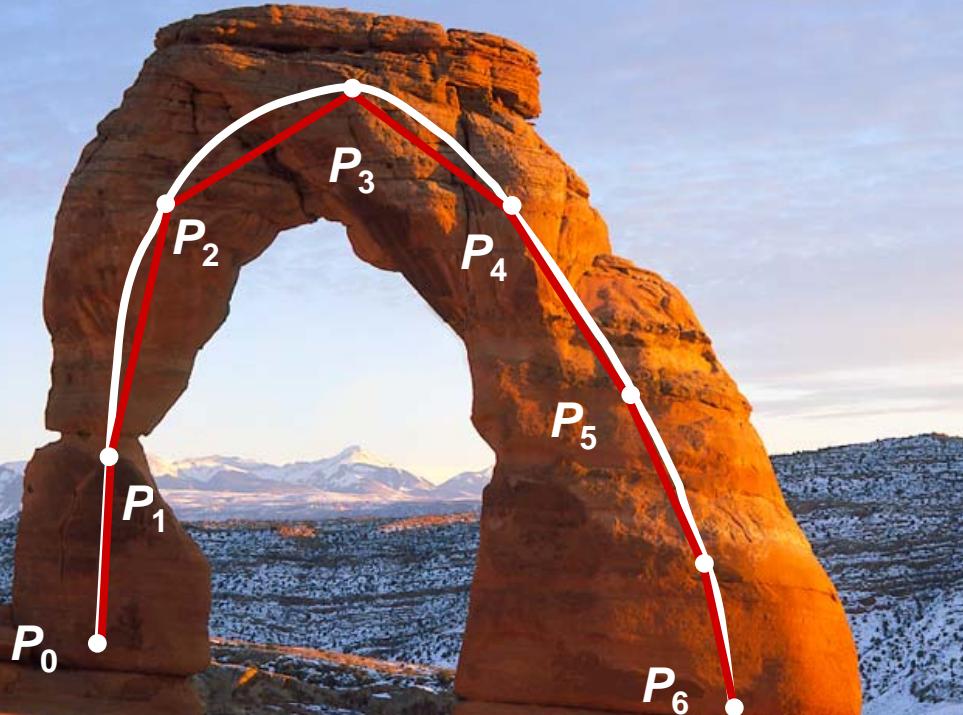


MA205 – LSN 17

Arc Length



National Park Service
Arches National Park

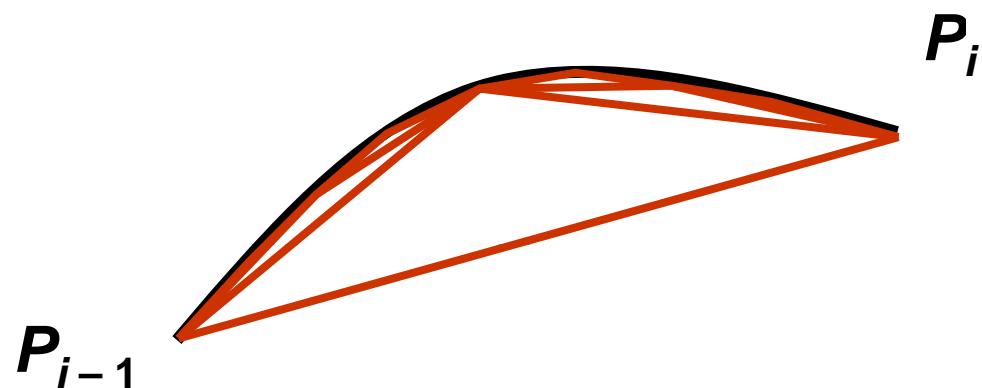
National Park Service
U.S. Department of the Interior



<http://www.nps.gov/arch/gallery/arches3.tif>

Objectives

- Develop the formula for computing the arc length of a space curve.
- Determine the arc length between two points on a space curve.



$$L = \lim_{n \rightarrow \infty} \sum_{i=1}^n |P_{i-1}P_i|$$

$$|P_{i-1}P_i| = \sqrt{(\Delta x_i)^2 + (\Delta y_i)^2}$$

$$|P_{i-1}P_i| = \sqrt{(\Delta x_i)^2 + (\Delta y_i)^2}$$

$$f'(t_i) \approx \frac{\Delta x_i}{\Delta t} \quad g'(t_i) \approx \frac{\Delta y_i}{\Delta t}$$

$$\Delta x_i \approx f'(t_i) \Delta t \quad \Delta y_i \approx g'(t_i) \Delta t$$

$$|P_{i-1}P_i| \approx \sqrt{(f'(t_i) \Delta t)^2 + (g'(t_i) \Delta t)^2}$$

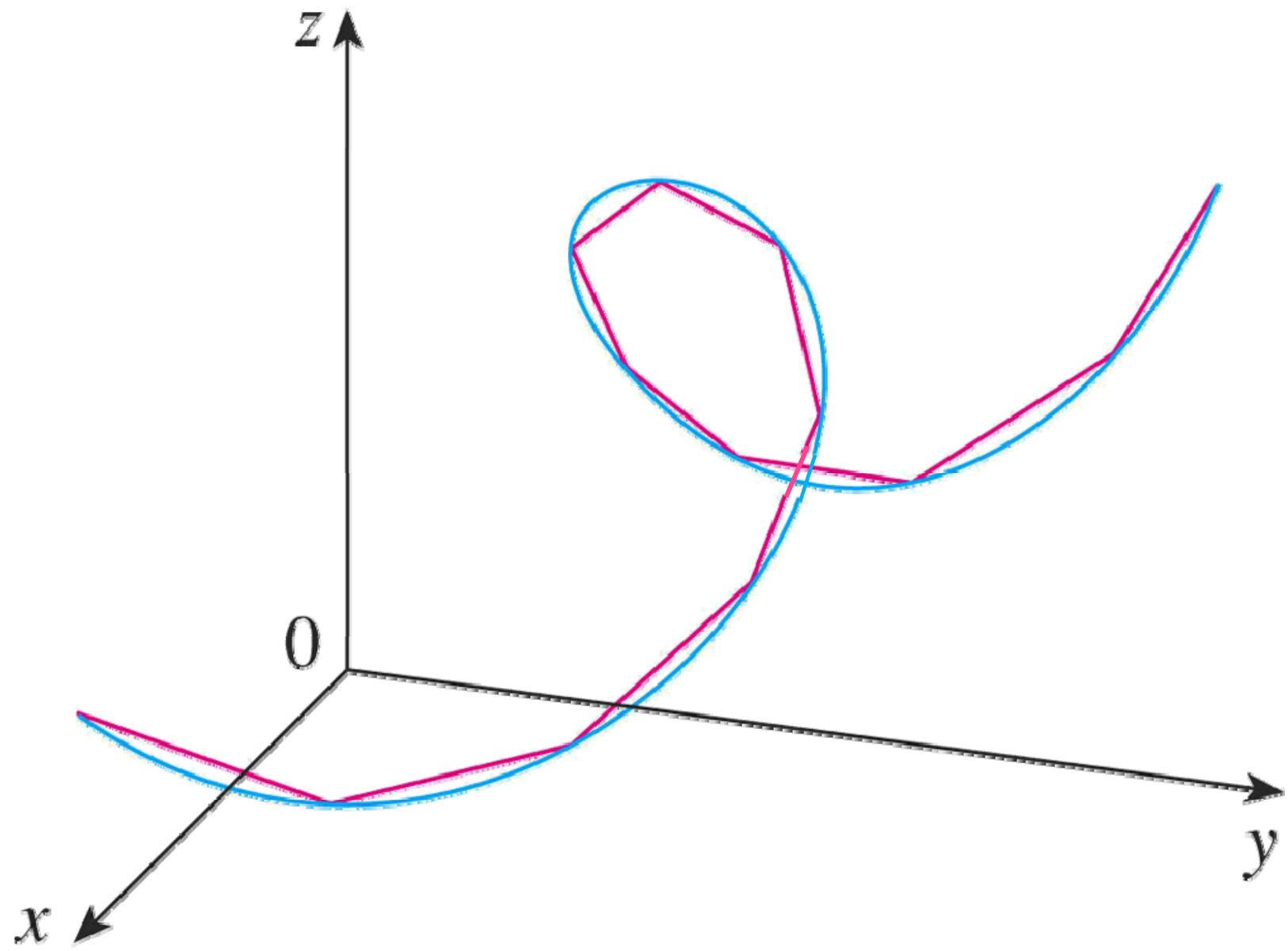
$$|P_{i-1}P_i| \approx \sqrt{(f'(t_i))^2 + (g'(t_i))^2} \Delta t$$

$$|P_{i-1}P_i| \approx \sqrt{(f'(t_i))^2 + (g'(t_i))^2} \Delta t$$

$$L \approx \sum_{i=1}^n \sqrt{(f'(t_i))^2 + (g'(t_i))^2} \Delta t$$

$$L \approx \lim_{n \rightarrow \infty} \sum_{i=1}^n \sqrt{(f'(t_i))^2 + (g'(t_i))^2} \Delta t$$

$$L = \int_a^b \sqrt{(f'(t_i))^2 + (g'(t_i))^2} dt$$



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

$$L = \int_a^b |\vec{r}'(t)| dt$$