

5-1 Videos Guide

5-1a

- Arc length formula for $y = f(x)$, $a \leq x \leq b$

- $L = \int_a^b \sqrt{1 + [f'(x)]^2} dx = \int_a^b \sqrt{1 + \left(\frac{dy}{dx}\right)^2} dx$

5-1b

Exercises:

- Set up an integral that represents the length of the curve. Then use your calculator to find the length correct to four decimal places.

$$y = xe^{-x}, \quad 0 \leq x \leq 2$$

- Find the exact length of the curve.

$$36y^2 = (x^2 - 4)^3, \quad 2 \leq x \leq 3, \quad y \geq 0$$

5-1c

- Arc length function

- $s(x) = \int_a^x \sqrt{1 + [f'(t)]^2} dt$

- Two forms for ds

- $ds = \sqrt{1 + \left(\frac{dy}{dx}\right)^2} dx = \sqrt{1 + \left(\frac{dx}{dy}\right)^2} dy$

- Arc length formula for $x = g(y)$, $c \leq y \leq d$

- $L = \int_c^d \sqrt{1 + [g'(y)]^2} dy = \int_c^d \sqrt{1 + \left(\frac{dx}{dy}\right)^2} dy$

Exercises:

- Find the exact length of the curve.

- $x = \frac{y^4}{8} + \frac{1}{4y^2}, \quad 1 \leq y \leq 2$

5-2d

- $y = \ln(\cos x), \quad 0 \leq x \leq \pi/3$
- $y = 1 - e^{-x}, \quad 0 \leq x \leq 2$