8.1 Videos Guide

8.1a

- Arc length formula for $y = f(x), a \le x \le b$
  - $L = \int_a^b \sqrt{1 + [f'(x)]^2}\, dx = \int_a^b \sqrt{1 + \left(\frac{dy}{dx}\right)^2}\, dx$

8.1b

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.
  $y = xe^{-x}, \quad 0 \le x \le 2$
- Find the exact length of the curve.
  $36y^2 = (x^2 - 4)^3, \quad 2 \le x \le 3, \quad y \ge 0$

8.1c

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

Exercises:

- Find the exact length of the curve.
  - $x = \frac{y^4}{8} + \frac{1}{4y^2}, \qquad 1 \le y \le 2$

8.2d

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