8.2 Videos Guide

8.2a

- Area of a surface of revolution
  - About the x-axis: $S = \int 2\pi y \, ds$
  - About the y-axis: $S = \int 2\pi x \, ds$
  - $ds = \sqrt{1 + \left(\frac{dy}{dx}\right)^2} \, dx = \sqrt{1 + \left(\frac{dx}{dy}\right)^2} \, dy$, whichever is most convenient
    Limits of integration: $a \leq x \leq b$ for $y = f(x)$; for $c \leq y \leq d$ for $x = g(y)$

8.2b

Exercise:

- Find the exact area of the surface obtained by rotating the curve about the x-axis.
  - $y = \sqrt{1 + e^x}, \qquad 0 \leq x \leq 1$
  - $y = \frac{x^3}{6} + \frac{1}{2x}, \quad \frac{1}{2} \leq x \leq 1$

8.2c

Exercise:

- The given curve is rotated about the y-axis. Find the area of the resulting surface.
  $x^{2/3} + y^{2/3} = 1, \qquad 0 \leq y \leq 1$