1. Find a value for \( n \) that guarantees that \( L_n \) will approximate the value of the integral within \( \pm 0.005 \).
   
   \[
   \int_{0}^{2} \sin(x^2) \, dx
   \]

2. Find the area of the region bounded by the curves \( y = \sin(x) \) and \( y = \cos(x) \) in the interval \( [0, 2\pi] \).

3. **Set-up**, but do NOT evaluate, an integral that would find the length of the curve \( y = f(x) = x^{\frac{5}{3}} \) from \( x = 0 \) to \( x = 8 \).
4. Sketch the region in the first quadrant bounded by the curves \( y = \sqrt{x} \), \( y = 0 \), and \( x=4 \). **Set-up**, but do NOT evaluate, an integral that would find the volume in each of the following cases.

   a) the region were rotated around the x-axis.

   b) the region were rotated around the y-axis.

   c) the region were rotated around \( x = 4 \).

Bonus: Evaluate the integral in #3.