1. Differentiate \( y = \sqrt{4x + 3(2x - 1)^4} \). Simplify (fully factor) your result.

2. What is the mistake in the following definite integral:
\[
\int_{-1}^{3} \frac{1}{x} \, dx = \ln|x| \bigg|_{-1}^{3} = \ln|3| - \ln|-1| = \ln 3 - \ln 1 = \ln 3 - 0 = \ln 3
\]

3. Find the area of the region enclosed by the curves \( x = y^2 - 1 \), and \( x = 1 - y^2 \).

4. Find the volume of the solid formed by rotating the region bounded by \( y = x^2 \), \( y = 0 \), and \( x = 1 \), about the \( x \)-axis.

5. Consider the region in problem #4 rotated about the \( y \)-axis.
   a. Set up the integral (do not evaluate) to find the volume of the resulting solid using washers.
   b. Set up the integral (do not evaluate) to find the volume of the resulting solid using Shells.
   c. What should you now about your answers to parts a. and b. even without finding the answers?

6. Find the volume of the solid obtained by rotating the region bounded by the curves \( y = \frac{1}{x} \), \( y = 0 \), \( x = 1 \), and \( x = 2 \) about the \( y \)-axis.

7. Set up the integral (do not evaluate) to find the volume of the solid formed by rotating the region bounded by \( y = x \) and \( y = \sqrt{x} \) about the line \( x = -1 \).

8. If 16 lbs of force is required to keep a spring stretched 1 ft beyond its natural length, then find the work required to stretch the spring 6 inches.

9. A heavy rope, 50 ft long, weighs 0.5 lb/ft and hangs over the edge of a building 120 ft high. How much work is done in pulling half the rope to the top of the building?

10. Consider the function \( f(x) = \sqrt{x} \) on \([0,4]\).
   a. Sketch \( f \) over \([0,4]\) and find the average value.
   b. Find \( c \) such that \( f_{\text{avg}} = f(c) \).
   c. On your graph of \( f \) sketch a rectangle whose area is the same as the area under the graph of \( f \).