1 (20 pts.) The region enclosed by the curves

\[ y = x^{1/2}, \quad y = x^{1/4}, \quad 0 \leq x \leq 1 \]

is revolved about the y-axis. Find the volume of the resulting solid.

2 (20 pts.) The parametric curve

\[ x = \frac{2}{3} t^{3/2}, \quad y = 2\sqrt{t}, \quad 0 \leq t \leq \sqrt{3} \]

is revolved about the y-axis. Find the area of the resulting surface.

3 (15 pts.) If a force of 90 N stretches a spring 1 m beyond its natural length, how much work does it take to stretch the spring 5 m beyond its natural length?

4 (20 pts.) The shape of a water tank is determined by revolving the curve \( y = x^2 \), \( 0 \leq x \leq 4 \) about the y-axis. The container is filled with water. What is the work required to pump all the water out over the top edge of the tank? (the weight-density of water is 10,000 N/m³, and assume all distance units are in meters).

5 (15 pts.) A cubical tank with sides 3 m long is filled with water to a depth of 2 m. Find the total force of the water on one side of the tank (the weight-density of water is 10,000 N/m³).

6 (10 pts.) Evaluate the following integral

\[ \int (\csc x - \sec x)(\sin x + \cos x)dx. \]