1. Find the area of the surface obtained by rotating the curve about the y-axis.

\[ y = \frac{1}{4} x^2 - \frac{1}{2} \ln x, \quad 1 \leq x \leq 2 \]

\[ 10\pi / 3 \]

2. Find the area of the surface obtained by rotating the curve about the x-axis.

\[ x = \frac{1}{3} (y^2 + 2)^{3/2}, \quad 1 \leq y \leq 3 \]

\[ 48\pi \]

3. If the infinite curve \( y = e^{-x}, \ x \geq 0 \), is rotated about the x-axis, find the area of the resulting surface.

\[ \pi \left( \sqrt{2} + \ln(1 + \sqrt{2}) \right) \]

4. Find the area of the surface obtained by rotating the curve about the x-axis.

\( y = x^3, \ 0 \leq x \leq 3 \)

\[ \frac{\pi}{27} \left( 730\sqrt{730} - 1 \right) \]

5. Find the area of the surface obtained by rotating the curve about the x-axis.

\( x = \frac{1}{2\sqrt{2}} (y^2 - \ln y), \ 1 \leq y \leq 2 \)

\[ \frac{\pi}{8} \left( 21 - 8\ln 2 - (\ln 2)^2 \right) \]

6. Let \( L \) be the length of the curve \( y = f(x), \ a \leq x \leq u \), where \( f \) is positive and has a continuous derivative. Let \( S_f \) be the surface area generated by rotating the curve about the x-axis. If \( c \) is a positive constant, define \( g(x) = f(x) + c \) and let \( S_g \) be the corresponding surface area generated by the curve \( y = g(x), \ a \leq x \leq u \). Express \( S_g \) in terms of \( S_f \) and \( L \).

\[ S_g = S_f + 2\pi cL \]

7. If the curve \( y = f(x), \ w \leq x \leq u \), is rotated about the horizontal line \( y = r \), where \( f(x) \leq r \), find a formula for the area of the resulting surface.

\[ \int_w^u 2\pi (r - f(x)) \sqrt{1 + \left( \frac{df(x)}{dx} \right)^2} \, dx \]