Practice Exam:

1. Find the volume of the shape generated by revolving \( f(x) = \sin^2 x \) from \( x = 0 \) to \( x = \pi \) around the x-axis.

2. Find the volume of the shape generated by revolving \( f(x) = \cos x \) from \( x = 0 \) to \( x = \frac{\pi}{2} \) around the y-axis.

3. Find \( y(t) \) such that \( \frac{dy}{dt} = \frac{\cos t}{\cos y} \).

4. Find the solution to \( \frac{dy}{dt} = \frac{t}{\arctan y} \) in a form \( F(t,y) = 0 \).

5. Find the solution to \( \frac{dy}{dt} = \frac{t}{y \sin y} \) in a form \( F(t,y) = 0 \).

6. Find the arclength of \( f(x) = x^3 \) from \( x = -1 \) to \( x = 1 \).

7. Find \( y(t) \) such that \( \frac{dy}{dt} = \frac{y^2 - 1}{t} \).

8. Find \( T(t) \) and \( k \) such that \( \frac{dT}{dt} = k(T - 10) \), where \( T(0) = 0 \) and \( T(60) = 4 \).