1. Evaluate \( \int \frac{x^2}{(4-x^2)^{3/2}} \, dx \).

2. Evaluate \( \int \cos^3 x \sin^2 x \, dx \).

3. Evaluate \( \int x \sec x \tan x \, dx \).

4. Evaluate \( \int \frac{x^2 + 8x - 3}{x^3 + 3x} \, dx \).

5. Evaluate \( \int \frac{dx}{x^2 \sqrt{x^2 + 1}} \).

6. Evaluate \( \int \tan^4 x \sec^2 x \, dx \).

7. Evaluate \( \int \frac{x^3 + 4x^2}{x^2 + 4x + 3} \, dx \).

8. Evaluate \( \int e^{-2x} \sin 3x \, dx \).

9. Find the area of the surface generated by revolving the curve \( y = \ln x \) from \( x = 1 \) to \( x = e \) about the \( y \)-axis.

10. The region in the first quadrant enclosed by the coordinate axis, the curve \( y = e^x \) and the line \( x = 1 \) is revolved about the \( y \)-axis to generate a solid. Find the volume of the solid.

11. Let \( R \) be the region in the first quadrant that is bounded above by the line \( y = 1 \), below by the curve \( y = \ln x \) and on the left by \( x = 1 \). Find the volume of the solid generated by revolving the region \( R \) about the \( x \)-axis.

12. Solve the initial value problem \( x \frac{dy}{dx} = \sqrt{x^2 - 4} \) for \( x \geq 2 \) where \( y(2) = 0 \).

13. Solve the initial value problem \( 3x^4 + 4x^2 + 1 \frac{dy}{dx} = 2\sqrt{3} \) where \( y(1) = \frac{\pi \sqrt{3}}{4} \).