Evaluate the following integrals.

1. \[ \int \frac{x^2 + 2}{x^2} \, dx \]

2. \[ \int \sin^2 3x \cos 3x \, dx \]

3. \[ \int \frac{1}{x \ln x} \, dx \]

4. \[ \int \frac{3}{x^2 + 2x + 1} \, dx \]

5. \[ \int_{-\pi}^{\pi} \sin^2 x \, dx \]

6. \[ \int xe^{(x^2-1)} \, dx \]

7. A) Write TWO definite integrals (one with respect to x, the other with respect to y) which represent the area, \( \Omega \), bound between the graphs of \( f \) and \( g \)

\[ f(x) = \sqrt{x} \quad g(x) = \frac{1}{3} x \]
B) Find the volume of the solid generated by rotating $\Omega$ about the $x$-axis

C) Determine a definite integral which represents the volume of the solid generated by rotating the area $\Omega$ about the $y$-axis.

8. Find the volume obtained by rotating the region bounded by
   \[ y = \ln x, \quad y = 2, \quad x = 0, \quad y = 0 \]
   about the $y$-axis

9. Use the shell method to determine the volume obtained by rotating the region bounded by
   \[ f(x) = x^2, \quad g(x) = 2x \]
   about the $x$-axis

Integration by parts practice:

10. \[ \int x \cos 3x \, dx \]

11. \[ \int \frac{\ln x}{x^3} \, dx \]

12. \[ \int e^x \sin x \, dx \]

Trigonometric Integrals practice:

13. \[ \int \sin^3 x \cos^2 x \, dx \]

14. \[ \int \cos^2 x \sin 2x \, dx \]

15. \[ \int \tan^3 x \sec x \, dx \]