1) Solve the differential equation

$$\frac{dy}{dx} = x + 6 - \frac{2}{x}y,$$

and find the solution which satisfies the condition $y(1) = 5/4$.

2) Evaluate the integral

$$\int_0^1 x\cos(2x)\ dx.$$

3) Compute

$$\int \frac{1}{x^2\sqrt{x^2 + 9}}\ dx.$$

4) Compute

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

5) Find

$$\int \frac{1}{x^2 + 2x - 3}\ dx.$$

6) Determine whether the integral $\int_2^\infty \frac{1}{x\ln(x)}\ dx$ diverges or converges. If it converges, determine its value; if it diverges, give the reason.