First order differential equation

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$$y' + p(x)y = 0$$

$$\frac{dy}{dx} + p(x)y = 0 \qquad \left|\frac{dx}{y}\right.$$

$$\frac{dy}{y} + p(x)dx = 0$$

$$\int \frac{dy}{y} + \int p(x)dx = 0$$

$$\ln|y| = C_0 - \int p(x)dx$$

$$|y| = e^{C_0 - \int p(x)dx}$$

$$|y| = e^{C_0} e^{-\int p(x)dx}$$

$$y = Ce^{-\int p(x)dx} \qquad C = \pm e^{C_0}$$