Ex: $ty' = \frac{\sin t}{t} - 2y \quad , \quad t > 0$

Step 0: Standard form

$$y' + \frac{2}{t}y = \frac{\sin t}{t^2}$$

Step 1: Mult by μ s.t exact derivative on LHS

$$\mu y' + \frac{2}{t}\mu y = \mu \frac{\sin t}{t^2}$$

Choose $\mu > 0$

$(\mu y)'$

$$\mu y' + \mu' y \quad \Rightarrow \quad \mu' = \frac{2}{t}\mu \quad \Rightarrow \int \frac{d\mu}{\mu} = \int \frac{2}{t}\,dt$$

$$\Rightarrow \ln \mu = 2 \ln t$$

($\mu > 0$, $t > 0$)

$$\Rightarrow \mu = e^{2\ln t} = e^{\ln t^2} = t^2$$

$$\boxed{\mu = t^2}$$

Step 2: Integrate

$$(\mu y)' = \mu \frac{\sin t}{t^2}$$

$$\Rightarrow \quad (t^2 y)' = \sin t$$

$$\Rightarrow \quad t^2 y = \int \sin t$$

$$= -\cos t + c$$

Step 3: Solve for y

$$\boxed{y(t) = \frac{-\cos t}{t^2} + \frac{c}{t^2}}$$