

Solve the differential eq: $\cos x \, dy = y(\sin x - y) \, dx$

$$\frac{dy}{dx} = \frac{y \sin x - y^2}{\cos x}$$

$$\frac{dy}{dx} = y \tan x - y^2 \sec x$$

$$\frac{1}{y^2} \frac{dy}{dx} = \frac{1}{y} \tan x - \sec x$$

$$-\frac{1}{y^2} \frac{dy}{dx} + \frac{1}{y} \tan x = \sec x$$

put $\frac{1}{y} = t$

$$\frac{dt}{dx} + t \cdot \tan x = \sec x$$

$$\therefore \text{IF} = e^{\int \tan x \, dx} = e^{\ln |\sec x|} = \sec x$$

$$t \cdot \sec x = \int \sec x \cdot \sec x \, dx + c$$

$$\frac{1}{y} \sec x = \tan x + c$$

$$\boxed{\sec x = y(\tan x + c)}$$