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(Q2) $y' = ay + by^2$

$$\frac{dy}{dx} = ay + by^2$$

$$\frac{dy}{dx} - ay = by^2$$

Divide both sides by y^2

$$\frac{1}{y^2}\frac{dy}{dx} - \frac{a}{y} = b$$

$$u = \frac{-1}{y} \Rightarrow \frac{du}{dx} = \frac{1}{y^2}\frac{dy}{dx}$$

$$\frac{du}{dx} + au = b$$

$$I.F = e^{\int a\,dx} = e^{ax}$$

$$u(e^{ax}) = \int be^{ax}\,dx \Rightarrow b\int e^{ax}\,dx$$

$$u(e^{ax} = \frac{be^{x}}{a} + c \Rightarrow \frac{-e^{ax}}{y} \Rightarrow \frac{be^{ax}}{a} + c$$

$$= -e^{ax}\left(\frac{1}{y} + \frac{b}{a}\right) = c \Rightarrow \frac{1}{y} + \frac{b}{a} = -ce^{-ax}$$

$$\frac{1}{y} = -\left[\frac{b}{a} + ce^{-ax}\right] \Rightarrow \frac{1}{y} = -\left[\frac{b + ace^{-ax}}{a}\right]$$

$$\boxed{y = \frac{-a}{b + ace^{-ax}}}$$