

Welcome to ODEs PILOT.

week 1

webpage: jhu-ode-pilot.github.io/SU24/

$$2y^2x^2 + y^2 = xy'$$

$$y^2(2x^2 + 1) = x \frac{dy}{dx}$$

$$\int \frac{dy}{y^2} = \int \frac{(2x^2 + 1) dx}{x}$$

$$-\frac{1}{y} = x^2 + \log x + \underline{C}$$

$$y = \frac{-1}{x^2 + \log x + \underline{C}}$$

$$\boxed{e^{x+C} \Downarrow \tilde{C}e^x}$$

$$2C = \tilde{C}$$

$$\frac{1}{2}C = \tilde{C}$$

$$y' = y(x^2 - 1), \quad y(1) = K$$

$$\frac{dy}{dx} = y(x^2 - 1)$$

$$\int \frac{dy}{y} = \int (x^2 - 1) dx$$

$$\log|y| = \frac{1}{3}x^3 - x + C$$

$$y = \tilde{C} e^{\frac{1}{3}x^3 - x}$$

$$y(1) = K$$

$$\begin{aligned} y(1) &= \tilde{C} e^{\frac{1}{3} - 1} \\ &= \tilde{C} e^{-2/3} = K \end{aligned}$$

$$\tilde{C} = K \cdot e^{2/3}$$

$$y = \boxed{K} e^{\boxed{\frac{1}{3}x^3 - x + \frac{2}{3}}}$$

$$x \rightarrow \infty$$

$$y \rightarrow \infty$$

$$K > 0$$

$$\begin{aligned} &\downarrow \\ &+\infty \\ &+\infty \end{aligned}$$