1. Solve the following initial value problem:

\[ \frac{dy}{dx} = 2e^{y_x}, \quad y(0) = 0 \]

What is the interval of validity for your solution?

2. Solve the following first order equation:

\[ y' = -\frac{3y}{x} + \frac{\sqrt{1+x^2}}{x^2} \]
3. Solve the following exact equation:

\[ y^2 e^{xy} + (e^{xy} + xye^{xy} + 1) \frac{dy}{dx} = 0 \]