1. Find the general solution to the following ODEs
\[
\frac{dy}{dx} = \frac{x - e^{-x}}{y + ey} \\
xy' = \sqrt{9 - y^2}
\]

2. Find the solution to the following IVPs
\[
y' = (1 - 2x)y^2, y(0) = -1/6 \\
y' = \frac{x(x^2 + 1)}{4y^3}, y(0) = -1/\sqrt{2}
\]

3. Find the interval of existence for the following IVPs
\[
y' + \frac{t^4}{(t - 2)y^3}y = \sqrt{t}, y(1) = 8 \\
(1 - t^4)y' + (\ln t)y = \cot 2t, y(2) = 0
\]

4. Find the region of \((x_0, y_0)\) in the \(xy\)-plane such that the following IVP is guaranteed to have at least a local solution
\[
y' = \frac{1}{1 + 2y - 3t}, y(x_0) = y_0 \\
y' = \sqrt{y + t}, y(x_0) = y_0
\]