1. Solve the separable initial value problem \( y' = 2\sqrt{y + 1}\cos(x) \) with \( y(\pi) = 0 \).

2. Solve the homogeneous equation \( y' = \frac{(xy + y^2 + x^2)}{xy} \).

3. Use the substitution \( u = x + y \) to find the general solution of \( y' = \tan(x+y) - 1 \).
4. Solve the exact equation \((\sinh(x) \cos(y)) \, dx = \cosh(x) \sin(y) \, dy = 0\) with \(y(0) = 0\).

5. Use the integrating factor \(F = \frac{1}{xy}\) to solve \((2y + xy) \, dx + 2x \, dy = 0\).

6. Find an integrating factor and use it to solve 
\[(2y^2 + 2y + 4x^2) \, dx + (2xy + x) \, dy = 0.\]
7. Solve the **first order linear** initial value problem for \( y(x) \)
\[
\frac{1}{x} y' - \frac{2}{x^2} y = x \cos(x) \quad \text{with} \quad y(\pi) = 1.
\]

8. Find the general solution of the **Bernoulli equation**
\[
y' = \frac{2y}{x} - x^2 y^2.
\]