1. (20%) Solve the following differential equation.

\[ 2e^x y^2 dy = (x + 2) dx \]

2. (20%) Solve the following initial value problem (IVP).

\[ x^2 \sin(2y) dx + 2x \cos(2y) dy = 0 \quad ; \quad y(1) = \frac{\pi}{4} \]

3. (20%) Find an implicit solution of the following differential equation.

\[
\frac{dy}{dx} = \frac{xy^2 - \cos x \cdot \sin x}{y(1 - x^2)}
\]

4. (20%) Find the other solution and general solution if one solution is given as \( y_1 = x + 1 \)

\[(x + 1)^2 y'' - 3(x + 1)y' + 3y = 0\]

5. (20%) Find a general solution of the following differential equation.

\[ y'' + y' + y = e^{2x} \]