1. Solve the following differential equation using Separation of Variables.
\[
\frac{dy}{dx} = xe^y
\]

2. Solve the following differential equation using Separation of Variables.
\[
\frac{dx}{dt} = txe^t
\]

3. Solve the following differential equation using Separation of Variables.
\[
x^2y' + e^y = 0
\]

4. Solve the following differential equation using Separation of Variables.
\[
yy' = e^x
\]

5. Solve
\[
y' + 3y = x + e^{-2x}
\]

6. Solve
\[
y' - y = 2e^x
\]

7. Solve
\[
xy' + 2y = \sin(x)
\]

8. Solve the following initial value problem
\[
y' - y = 2xe^{2x} \quad ; \quad y(1) = 0
\]

9. Solve the following initial value problem
\[
y' + \frac{2}{x}y = \frac{\cos(x)}{x^2} \quad , \quad y(\pi) = 0
\]