1.) (3pts) Let \( L \) be a linear differential operator. If \( Ly_1 = e^x \) and \( Ly_2 = e^{-x} \), then find a particular solution of the DE \( Ly = e^{x-2} - 2\sinh x \).

2.) (4pts) Use reduction of order to find a second solution \( y_2 \) of the DE: 
\((1 - x^2)y'' - 2xy' + 2y = 0, \ x > 1, \) giving that \( y_1 = x \) is a solution.

3.) (3pts) Solve the DE: \( 3y''' - 5y'' - 3y' + 5y = 0 \).

3a) The auxiliary equation is
\[ 3m^3 - 5m^2 - 3m + 5 = 0 \]
\[ m = 1 \] is a root.

\[ 3m^3 - 5m^2 - 3m + 5 \]
\[ 3m^2 - 2m = 5 \]
\[ m = 1 \]
\[ m = 5 \]
\[ m = -5 \]

\[ \Delta = 4 + 60 = 64 > 0 \]

\[ m_1 = \frac{2 - \sqrt{6}}{3} = -1 \]
\[ m_2 = \frac{2 + \sqrt{6}}{3} = \frac{5}{3} \]

\[ y = C_1 e^{3x} + C_2 e^{-x} + C_3 e^{\frac{\sqrt{6}}{3}x} \]
1.) (3pts) Let $L$ be a linear differential operator. If $L y_1 = e^x$ and $L y_2 = e^{-x}$, then find a particular solution of the DE $L y = e^{x^2} + 2 \cosh x$.

2.) (4pts) Use reduction of order to find a second solution $y_2$ of the DE: $(1 - x^2) y'' + 2xy' - 2y = 0$, giving that $y_1 = 1 + x^2$ is a solution.

3.) (3pts) Solve the DE: $2y''' - 3y'' - 2y' + 3y = 0$.