Name:..........................................................ID #.....................
Serial #:.........Section#..........
Q1. Consider the differential equation \( x^2 y'' + xy' + \left(x^2 - \frac{1}{4}\right)y = x^{3/2} \) \((*)\)

(i) Verify that \( y_1 = x^{-1/2} \cos x \) is a solution of the homogeneous d.e.
(ii) Let \( y_2 = u \ y_1 \). Show that \( y_2 = x^{-1/2} \sin x \)
(iii) Find a particular solution \( y_p \) of the d.e. \((*)\)
Q2. Find a particular solution of \( y'' + y' + \frac{1}{4}y = e^x (\sin 3x - \cos 3x) \)
using the annihilator method.
Q3. Solve \( y'' - 2y' + 2y = e^x \tan x \)
Q4. Solve the (IVP) \( x^2 y'' - 5xy' + 8y = 8x^6, \quad y(1) = 0, \quad y'(1) = 0 \)
Q5. Verify that \( y_1 = x \) is a solution of \( x^2 y'' - (x^2 + 2x)y' + (x + 2)y = 0 \).
Use reduction of order to solve \( x^2 y'' - (x^2 + 2x)y' + (x + 2)y = x^3 \)