Instructions:
Do your own work. You may consult class notes, the course text, or other books. Give a reference if you use some source other than class notes or the course text.

Turn in a complete and concise write up of your work. Show enough detail so that a peer could follow your work (both computations and reasoning). If you are not confident in some result, you will receive more credit if you make a note of this and comment on where you might be going wrong or on alternate approaches you might try.

For any solution in the form of a power series, determine a recurrence equation for the coefficients. Solve the recurrence equation or compute at least 4 nonzero terms. If the series has a finite number of nonzero terms, compute all coefficients.

Do any four of the six problems. Circle the problem number for each problem you submit. Each problem has a maximum value of 25 points.

The exam is due Wednesday, April 13 at 4:00 pm.

1. Find the general solution of \( x''(t) - 2x'(t) + x(t) = \frac{e^t}{t} \) for \( t > 0 \)

2. Find the general solution of \( t^2 \frac{d^2 x}{dt^2} - 2t \frac{dx}{dt} + 2x = t^m \) for \( t > 0 \).

3. Find the general solution of \( x'' + t^3 x' + tx = 0 \).

4. Find the general solution of \( 2t^2 x'' + (7t^2 + 7t)x' - 3x = 0 \) for \( t > 0 \).

5. Find the general solution of the third-order equation \( \frac{d^3 x}{dt^3} + t \frac{dx}{dt} + x = 0 \).

6. Find the specific solution of the initial-value problem

\[ x''(t) + (t + 1)^2 x'(t) - 4(t + 1)x(t) = 0, \quad x(-1) = 0, \quad x'(-1) = 1. \]