1. Find the form of a particular solution to \( y'' - 2y' + 2y = e^{-t} \sin(2t) + 2t + te^{-t} \sin(t) \).

2. Find all eigenvalues and the corresponding eigenfunctions for the boundary value problem
   \[ y'' + \lambda y = 0 \quad y(0) = 0 \quad y(2) + y'(2) = 0 \]

3. Calculate the Fourier series expansion for the function given below in a full period.
   \[ f(t) = \begin{cases} 
   -t & -1 < t < 0 \\
   t & 0 < t < 1 
   \end{cases} \]

4. Find the general solution for \( y'' + 4y = 3 + \cos(2x) \)

5. Solve the IVP
   \[ y'' + y' - 2y = 2x \quad y(0) = \frac{1}{2} \quad y'(0) = 2 \]

6. Determine if the oscillator described by the following equation for \( x(t) \) is overdamped, underdamped, or critically damped. Then draw a few possible solution curves.
   \[ x'' + 2x' + x = 0 \]

7. Find the general solution for \( y''' + 4y' = 24x^2 \)

8. Find a general solution \( x(t) \) for the following oscillator equation and then draw a possible solution curve. How would you change the equation so the oscillator is not in pure resonance?
   \[ x'' + 9x = 3 \cos(3t) \]

9. Find all eigenvalues and the corresponding eigenfunctions for the boundary value problem
   \[ y'' + \lambda y = 0 \quad y'(0) = 0 \quad y(2) = 0 \]

10. Calculate the Fourier series expansion for \( f(t) \) where \( f \) is an even function and in the half-period \( 0 < t < 3 \) is given by \( f(t) = t + 2 \)

An Ending Thought: Many of life’s failures are people who did not realize how close they were to success when they gave up.

– Thomas Edison