1. Find all solutions to the equation
\[ y'' + y = 2x - 1. \]

2. Solve the equation
\[ xy'' + 2y = 0 \]
using Frobenius’ method.

3. Find a Fourier series for the ramp function
\[ f(x) = \begin{cases} 
  x & \text{for } 0 \leq x \leq 1 \\
  1 & \text{for } 1 \leq x \leq 2.
\end{cases} \]
on the interval \([0, 2]\).

4. If \( f \) is represented by the series \( f(x) = \sum c_n e^{inx} \) and \( g \) by the series \( g(x) = \sum d_n e^{inx} \), prove the generalized Parseval theorem:
\[
\frac{1}{2\pi} \int_0^{2\pi} f(x)\overline{g(x)} \, dx = \sum_{n=-\infty}^{\infty} c_n \overline{d_n}.
\]