1. Determine the singular points of the differential equation
   \[ x^3 (x - 5) (x - 2) y'' + 3x^2 (x - 2) y' + y = 0. \]
   Classify each singular point as regular or irregular.

2. \( x = 0 \) is a regular singular point of the differential equation
   \[ x^2 y'' + \left( \frac{5}{3} x + x^2 \right) y' + -\frac{1}{3} y = 0. \]
   Find the roots of the indicial equation
3. Find two power series solutions of the differential equation $y'' - xy = 0$
   about the ordinary point $x = 0$. 
4. Consider the following differential equation
\[ 3xy'' + 2y' - y = 0 \]

(a) Find the indicial equation and its roots
(b) Find the power series solution associated to the largest indicial root