1. Find the power series solutions of the following differential equations about $x_0 = 0$:

   (a) $(x^2 - 1)y'' + xy' - y = 0$.

   (b) $y'' + e^x y' - y = 0$.

   You will need to determine if $x_=0$ is a regular point or not. For part (b), first expand e^x about x_0 as a power-series. Plot the two solutions for each of the above, by retaining m terms with $m = 1, 2, 5, 10, 20$ and 50.

2. Consider the expression

$$\sum_{n=2}^{\infty} n(n-1)c_n x^n + 5\sum_{n=2}^{\infty} n(n-1)c_n x^{n-2} + 2\sum_{n=1}^{\infty} nc_n x^n.$$

   Rewrite the above so that it is a single power series with a general term x^m.