1. Consider the following predator–prey system:

\[
x' = x(1.5 - 0.5y) \\
y' = y(-0.5 + x)
\]

(a) What are the equilibrium solutions of this system?

(b) Find the linearization of the system about the equilibrium solutions.

(c) Are the equilibria stable or unstable?

2. Consider the Bessel equation of order 1/2

\[x^2 y'' + xy' + (x^2 - 1/4)y = 0.\]

Suppose we are interested in a series solution for \( y \) starting at \( x = 0 \).

(a) At what power of \( x \) should the series begin? (In other words, if we are looking for solutions of the form \( y = \sum_{n=0}^{\infty} a_n x^{n+r} \), what are the good values of \( r \) to choose?)

(b) Find a series solution for \( y \).