This activity will introduce some more components of MATLAB that are particular useful in studying systems of first order differential equations. You will learn how to produce phase plan portraits and how to generate solutions for linear systems with constant coefficients to check answers you obtain by hand.

Navigate to the MATLAB Examples folder within the HANDOUTS folder of MATH0226A for Spring22 on the CLASSES server within middfiles. Download the three files *phasePlane_tutorial.mix, plotPhasePlane.m*, and *SolvingLinearSystems.mix* into your MATLAB folder.

1. Open *phasePlane-tutorial* and Run the program,
   (a) Examine the "Stable Richardson Model" and discuss how the phase plane picture is consistent with the eigenvalues and associated eigenvectors. In particular, explain why the solutions approach one of the eigenvectors.
   (b) Provide a similar discussion for the "Unstable Richardson Model."
   (c) Discuss why there is a qualitatively different outcome in the Zero Eigenvalue Example. Or is it really different?
   (d) For one of these three examples, experiment with changing the value of M and comment on any differences you see or further insights you obtain.
2. Open *SolvingLinearSystems* and Run the program.
   (a) Use the program to solve the system in Example 3 on Page 185 of Brennan and Boyce and plot the solutions.
   (b) Modify the code to solve the system of three first order linear differential equations of Example 3 on Page 394 of Brennan and Boyce. Plot the solutions.
3. Save your live script as a pdf by clicking on the arrow beneath save and choosing "export to pdf." Make sure that you click the button that puts the output **beneath the code** and then print the pdf.