

MATH 315: Fall, 2024

Assignment 3

Due: Monday, September 23

I. Examining the Richardson Arms Race Model.

Read: Section D ("Further Analysis of the Richardson Model") of Part IV (*The Richardson Model*) in Chapter 2: **Stable and Unstable Arms Races** of our text.

Complete Problems 16, 18, 21 - 23 of Chapter 2.

II. MATLAB

Create a *MATLAB* model for the Richardson system given in Exercise 13 of Chapter 2 of our models text:

$$dx/dt = 4y - 3x + 1, dy/dt = 3x - 2y + 2$$

Use initial values (at $t = 0$) of .01 for x and .02 for y . Run the simulation from $t = 0$ until $t = 5$ with a value of .05 for dt . Tabulate values for x , y and the ratio y/x . Generate graphs for x and y as functions of time, for y vs x , and for the ratio as a function of time. What does *MATLAB* predict about the outcome of such an arms race?

Now create a *MATLAB* model for the following Richardson arms race:

$$dx/dt = 3y - 4x + 1, dy/dt = 2x - 3y + 2$$

with initial values $x_0 = 10$ and $y_0 = 20$. Run the simulation from $t = 0$ until $t = 5$ with a value of .05 for dt . Tabulate values for x , y and the ratio y/x . Generate graphs for x and y as functions of time, for y vs x , and for the ratio as a function of time. What does *MATLAB* predict about the outcome of such an arms race?