MATH 315: Fall 2024

Assignment 8

Due: Friday, October 4

I. Reading

Read Sections IV ("The competitive hunters model") and V ("The predator-prey model") of Chapter 4: **Ecological Models: Interacting Species** of our text.

Read Appendix IV on **Functions of Two Variables**.

II. Exercises

Complete Exercise 33 of Chapter 3.
Complete Exercises 11, 18, and 22 in Chapter 4.

To solve the problem, recall that the general solution of the second order differential equation $z''(t) = k^2 z(t)$ where k is a positive constant is

$$z(t) = A e^{kt} + B e^{-kt}$$

where A and B are arbitrary constants. [This is the "knowledge of differential equations beyond that demanded in the text."]

III. *MATLAB*

Create *MATLAB* versions of the competitive hunters and predator-prey models as they are presented in the text. Find the *MATLAB* analogues to Figures 4.9 and 4.12 in the text.

For **Predator Prey** model, set step size dt to be .001 and run the simulation from TIME = 0 to TIME = 2. The following four cases for initial levels (with corresponding values for K) give interesting graphs:

x_o	3	3	3	3
y_o	2	3	4	5
K	.143	.05	.01	.002

For the **Competitive Hunters** model, set step size dt to be .01 and run the simulation from TIME = 0 to TIME = 6. The following four cases for initial levels (with corresponding values for K) give interesting graphs:

x_o	9	9	1	1
y_o	5	6	1	.2
K	.81	.65	.91	.51