Math 2208: Ordinary Differential Equations

Assignment 7

Fall 2019 | **Subhadip Chowdhury** | **Due: Oct 23**

Reading

Section 2.1(The Predator Prey System), 2.2(The Predator Prey Vector Field, Examples of Systems and Vector Fields, Equilibrium Solutions) from the textbook.

Exercises

Don't forget to be neat and thorough. No fringe, and please use the cover page.

Question 1.

Book problems **1.9.(26)**.

Question 2.

Book problems from chapter **1** review exercises: **46, 48**.

Question 3.

Book problems **2.1.(15, 17)**.

Question 4.

Book problems **2.2.(7*a*, 7*b*, 11)**.

Additional Problems

Question 5.

Give a brief qualitative description of the behavior of solution to the following ODE. Note that we only give partial information about the function in the differential equation, so your description must allow for various possibilities. Be sure to deal with initial conditions of different sizes and to discuss the long-term behavior of solutions.

$$\frac{dy}{dt} - 2y = Q(t), \text{ where } -1 < Q(t) < 2 \text{ for all } t$$

Question 6: Linear Algebra Practice.

The following problems are things you have seen in linear algebra. Perhaps you need to refresh your memories, which is the purpose of these problems. You do NOT need to submit solutions to these problems, but it is highly recommended that you work these out.

1. Let $\mathbf{A} = \begin{bmatrix} 5 & 2 \\ 1 & 4 \end{bmatrix}$, $\vec{v} = \begin{bmatrix} 2 \\ 3 \end{bmatrix}$, and $a = .5$ and $b = 2$.
   (a) Compute $\mathbf{A}\vec{v}$.
   (b) Compute $a\vec{v}$.

(c) Draw the vector $\vec{v}$ in the (x, y) plane with the tail centered at the origin.

(d) Draw the vector $a\vec{v}$ in the (x, y) plane with the tail centered at the origin. How does this compare to the drawing for $\vec{v}$?

(e) Draw the vector $b\vec{v}$ in the (x, y) plane with the tail centered at the origin. How does this compare to the drawing for $\vec{v}$?

2. Compute the determinant of **A**. Show your work.

3. Compute the eigenvalues and eigenvectors of **A**. Show your work.