Math 216–S19 Written Homework 2

Instructions: Solve each of these problems. Your solution should be complete and written out in complete sentences. Where graphs are needed, you may include a print-out of output from *Matlab* (or another program, if you prefer).

1. Problem 13 in §3.2 of Brannan and Boyce (p.143 in the 3rd ed. text). Work with equations (10) and (11) instead of (5) and (6). Also complete parts (a) and (b), below.

   (a) If the critical point is (u_1^E, u_2^E), let $u_1 = x + u_1^E$ and $u_2 = y + u_2^E$; plug into the system to see that you obtain a homogeneous system $\mathbf{x}' = \mathbf{A}\mathbf{x}$. Note how this is the same as the procedure shown in §3.3, p.147.

   (b) Solve this system to find $\mathbf{x} = \begin{pmatrix} x \\ y \end{pmatrix}$ and then use this to write the solution for u_1 and u_2.

2. Problem 6 in §3.3 of Brannan and Boyce (p.165 in the 3rd ed. text).

3. Problem 26 in §3.3 of Brannan and Boyce (p.166 in the 3rd ed. text).

4. Problem 16 in §3.4 of Brannan and Boyce (p.177 in the 3rd ed. text). To draw the phase portraits, find the general solutions to the system for each value of α you consider.