

Assignment #4

Due on Monday, February 5, 2018

Read Section 4.1.2 on *Diagonalizable Systems* in the class lecture notes at <http://pages.pomona.edu/~ajr04747/>

Read Section 3.2, on *Straight-Line Solutions*, in Blanchard, Devaney and Hall.

Do the following problems

1. Explain why the following linear system of differential equations cannot be put in diagonal form.

$$\begin{cases} \frac{dx}{dt} = 2x + y; \\ \frac{dy}{dt} = -x + 4y. \end{cases}$$

2. Explain why the following linear system of differential equations cannot be put in diagonal form.

$$\begin{cases} \frac{dx}{dt} = ay; \\ \frac{dy}{dt} = -bx, \end{cases}$$

where a and b are positive constants

3. Explain why the following linear system of differential equations cannot be put in diagonal form.

$$\begin{cases} \frac{dx}{dt} = -2x - 3y; \\ \frac{dy}{dt} = 3x - 2y. \end{cases}$$

4. Determine whether or not the linear system

$$\begin{cases} \frac{dx}{dt} = y; \\ \frac{dy}{dt} = 8x - 2y \end{cases}$$

can be put in diagonal form. If so, give the general solution to the system and sketch the phase portrait.

5. Determine whether or not the linear system

$$\begin{cases} \frac{dx}{dt} = -3x + 2y; \\ \frac{dy}{dt} = 4x - 5y \end{cases}$$

can be put in diagonal form. If so, give the general solution to the system and sketch the phase portrait.