M346 (92153), Homework #6

Due: 10:00am, Monday, Jun. 18

Instructions: Questions are from the book "Applied Linear Algebra, 2nd ed." by Sadun. Please show all your work, not only your final answer, to receive credit. Keep answers organized in the same order the problems have been assigned.

Discrete-time evolution (5.1)

p. 102-103, #4, 5, 10

Matrix exponentials (4.8)

p. 89-90, #6, 8, 9

First-order continuous-time evolution (5.2)

p. 107-108, #2, 4, 6

In addition:

A) Find the solution of

$$\frac{d\boldsymbol{x}}{dt} = A\boldsymbol{x}, \qquad A = \begin{pmatrix} c & 2 \\ -2 & c \end{pmatrix}$$

with initial condition $\boldsymbol{x}(0) = (1, 0)^T$, where $c \in \mathbb{R}$ is some fixed constant. Sketch the phase plane diagram of the solution for $c = 1$, 0, and -1. In addition, sketch the graph of $x_1(t)$ and $x_2(t)$ versus time (where x_1, x_2 are the components of the solution $\boldsymbol{x}$). How does the behavior of the system change as we change c?