5.1 and 5.2 Handwrite Practice

Handwrite your responses to 1. and 2. below and collate them into a PDF for submission in ASULearn.

1. a) By hand, find all the eigenvalues and eigenvectors of $\begin{bmatrix} -4 & -1 \\ 6 & 1 \end{bmatrix}$. Show by hand work for the characteristic equation $|A - \lambda I| = 0$ and the eigenspaces of A (i.e. nullspaces of $A - \lambda I$) and keep any variables without pivots free, like we usually do.

   b) Sketch an input vector and output vector on one graph for an eigenvector on the line $y = -2x$ with $\lambda = -2$ and identify which is the input and which is the output.

   c) What does part a) tell us algebraically and geometrically about vectors on the line $y = -2x$?

2. Imagine a general reflection matrix that reflects over a line in $\mathbb{R}^2$ and argue geometrically:

   a) If we are on the line of reflection, what is the eigenvalue?

   b) Are vectors on the line that is perpendicular to the line of reflection an eigenvector (i.e. do the outputs realign on the same line as the inputs)? If so, what is the eigenvalue?

   c) Aside from vectors on the line of reflection or perpendicular to it, are there any other eigenvectors for a general reflection matrix?