Instructions

1. The statements in Italics are for introducing results and notations that may be used again in this course. You are only required to read and think about them.

2. To receive full credit you must explain how you got your answer.

3. While I encourage collaboration, you must write solutions IN YOUR OWN WORDS. DO NOT SHARE COMPLETE SOLUTIONS before they are due. YOU WILL RECEIVE NO CREDIT if you are found to have copied from whatever source or let others copy your solutions.

4. Workshops must be handwritten (electronic handwriting is allowed) for authentication purposes and submitted on Canvas. Please do NOT include any personal information such as your name and netID in your file. Late homework will NOT be accepted. It is your responsibility to MAKE SURE THAT YOUR SUBMISSIONS ARE SUCCESSFUL AND YOUR FILES ARE LEGIBLE AND COMPLETE. It is also your responsibility that whoever reads your work will understand and enjoy it. Up to 1 point out of 10 may be taken off if your solutions are hard to read or poorly presented.

Workshop 12

1. What does $det(A)$ being zero or not tell you about the solutions to $A\mathbf{x} = \mathbf{b}$, where $\mathbf{b} \neq \mathbf{0}$?

2. a. Draw pictures to show that the map $T : \mathbb{R}^2 \to \mathbb{R}^2$ given by 90° counterclockwise rotation about the origin is a linear transformation.

b. Does T have any eigenvectors and eigenvalues? If so, what are they?

3. a. Show that the map $T : \mathbb{R}^3 \to \mathbb{R}^3$ given by 90° counterclockwise rotation about the $z-$axis (by this I mean the $x-$axis would, for example, rotate to where the $y-$axis was) is a linear transformation.

b. Does T have any eigenvectors and eigenvalues? If so, what are they?

4. a. Let T be the linear transformation from the vector space of differentiable functions to the vector space of functions given by differentiation. Can you think of any eigenvectors and eigenvalues for T?

b. What about the linear transformation from the vector space of twice-differentiable functions to the vector space of functions given by taking second derivative?