Math 54 Midterm 2 Practice 1

1. Compute the inverse of
$$\begin{pmatrix} 3 & 0 & -2 \\ 0 & 1 & -1 \\ 4 & -3 & 0 \end{pmatrix}$$

2. Give an example of 3×3 matrix that is not diagonalizable and whose columns are linearly dependent.

3. What are the dimensions of the image and kernel of
$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{pmatrix}?$$

4. Let
$$A = \begin{pmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 & 1 \end{pmatrix}$$

   What is $\det(A)$? What are the eigenvalues of A? What are the dimensions of the eigenspaces of A?

5. Let[1]
$$A = \begin{pmatrix} -1 & 2 & 0 \\ -1 & 2 & 0 \\ 3 & -3 & 1 \end{pmatrix}$$

   What is A^{100}? (You can write the answer in terms of powers like 5^{100}).

6. What is the distance between the points $(1, 2, 0, 4, 1)$ and $(-2, 3, -1, 2, 0)$ in $\mathbb{R}^5$?

7. Let T be the triangle in $\mathbb{R}^2$ with corners at $(0,0)$, $(1,1)$ and $(\sqrt{3}, -\sqrt{3})$. What are the angles and side lengths of T?

8. What is the orthogonal complement to the plane $-2x + 3y + 5z = 0$ in $\mathbb{R}^3$?

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[1]Update 7/28: I changed A to make the solution nicer.