

Math 54 Midterm 2 Practice 2

1. Compute the inverse of

$$\begin{pmatrix} 1 & 2 & 1 \\ -1 & -1 & -1 \\ 0 & 0 & 1 \end{pmatrix}$$

2. Compute the determinant of

$$\begin{pmatrix} 2 & 1 & 3 & 0 \\ 1 & 0 & 1 & 0 \\ -1 & 1 & -1 & 2 \\ 2 & 0 & 1 & 0 \end{pmatrix}$$

3. Suppose that $\det(A) = 5$. What is $\det(A^{-1})$?

4. Let

$$A = \begin{pmatrix} -1 & 0 & 0 & 3 \\ -2 & 1 & 0 & 2 \\ -3 & 0 & 2 & 3 \\ 0 & 0 & 0 & 2 \end{pmatrix}$$

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

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

6. Find an orthonormal basis of the plane in \mathbb{R}^4 given by

$$\begin{cases} x_1 + x_2 + x_3 = 0 \\ x_2 + x_3 + x_4 = 0 \end{cases}$$

What is the orthogonal projection of $(-1, 1, -1, -1)$ to this plane?

7. Compute the inverse of the matrix

$$\begin{pmatrix} -2 & 1 & 1 & 1 & 1 & 1 \\ 1 & -2 & 1 & 1 & 1 & 1 \\ 1 & 1 & -2 & 1 & 1 & 1 \\ 1 & 1 & 1 & -2 & 1 & 1 \\ 1 & 1 & 1 & 1 & -2 & 1 \\ 1 & 1 & 1 & 1 & 1 & -2 \end{pmatrix}$$

8. Does there exist a 2×2 matrix all of whose singular values are 1 and that is not symmetric. If yes, give an example. If no, briefly comment why such a thing is not possible.