Name: _____

MATH 108
Fall 2021
HW 5: Due 10/05

"I go. You stay. No following."
–Iron Giant, Iron Giant

Problem 1. (10pt) Watch the following three videos by 3Blue1Brown (Grant Sanderson):

(i) Linear transformations and matrices

(ii) Matrix multiplication as composition

(iii) The determinant

What did you learn from these videos?

Problem 2. (10pt) Suppose the reduced-row echelon form for an augmented matrix is the following:

$$\begin{pmatrix} 1 & -4 & 0 & 1 & 0 & 5 \\ 0 & 0 & 1 & 0 & 0 & -1 \\ 0 & 0 & 0 & 0 & 1 & 3 \end{pmatrix}$$

Using this, find all the solutions to the system of equations.

Problem 3. (10pt) Can you compute the following product of matrices? If you can, compute the product. If you can not, explain why.

$$\begin{pmatrix} 1 & -1 & 8 \\ 2 & 3 & 5 \end{pmatrix} \begin{pmatrix} 1 & 4 \\ 0 & -6 \\ 7 & 7 \\ -8 & 0 \end{pmatrix}$$

Problem 4. (10pt) Showing all your work, compute the following:

$$\begin{pmatrix} 5 & 0 & 1 \\ -2 & -3 & 4 \\ 1 & -1 & 1 \end{pmatrix} \begin{pmatrix} 2 \\ -1 \\ 1 \end{pmatrix}$$

Problem 5. (10pt) Showing all your work, compute the following:

$$\begin{pmatrix} 1 & -1 & 2 \\ -3 & 6 & 0 \end{pmatrix} \begin{pmatrix} 0 & 4 \\ -2 & 3 \\ 3 & -2 \end{pmatrix}$$

Problem 6. (10pt) Compute the determinant of the following matrix:

$$\begin{pmatrix} 2 & 1 & 5 \\ -3 & 0 & 3 \\ 7 & 2 & 7 \end{pmatrix}$$

Is this matrix invertible? Explain.

Problem 7. (10pt) Find the inverse of the following matrix:

$$\begin{pmatrix} 2 & -1 \\ -3 & 4 \end{pmatrix}$$