

Math 2802 N1-N3 Worksheet 5

February 16th, 2018

1. **Exercise 3.1.10** Compute the determinant of A using cofactor expansions. Choose a row or column with the least amount of non-zero entries.

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

2. **Exercises 3.2.19 and 3.2.26**

a) If $\det \begin{pmatrix} a & b & c \\ d & e & f \\ g & h & i \end{pmatrix} = 7$, find the determinant of $\begin{pmatrix} a & b & c \\ 2d + a & 2e + b & 2f + c \\ g & h & i \end{pmatrix}$

- b) Use determinants to decide if the following set of vectors is linearly independent.

$$\left\{ \begin{pmatrix} 3 \\ 5 \\ -6 \\ 4 \end{pmatrix}, \begin{pmatrix} 2 \\ -6 \\ 0 \\ 7 \end{pmatrix}, \begin{pmatrix} -2 \\ -1 \\ 3 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 0 \\ 0 \\ -2 \end{pmatrix} \right\}$$

3. **Exercise 2.8.25** Find a basis for $Col(A)$ and a basis for $Nul(A)$.

$$A = \begin{pmatrix} 1 & 4 & 8 & -3 & -7 \\ -1 & 2 & 7 & 3 & 4 \\ -2 & 2 & 9 & 5 & 5 \\ 3 & 6 & 9 & -5 & -2 \end{pmatrix} \sim \begin{pmatrix} 1 & 4 & 8 & 0 & 5 \\ 0 & 2 & 5 & 0 & -1 \\ 0 & 0 & 0 & 1 & 4 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

4. **Exercise 2.9.17** Select true or false for the following statements

- a) If $\mathcal{B} = \{v_1, \dots, v_p\}$ is a basis for a subspace H and if $x = c_1v_1 + c_2v_2 + \dots + c_pv_p$, then c_1, \dots, c_p are the coordinates of x relative to the basis \mathcal{B} .
- b) Each line in \mathbf{R}^n is a one-dimensional subspace of \mathbf{R}^n .
- c) The dimension of $Col(A)$ is the number of pivot columns of A .
- d) The dimensions of $Col(A)$ and $Nul(A)$ add up to the dimension of the domain in a transformation with $T(x) = Ax$.
- e) If a set of p vectors span a p -dimensional subspace H of \mathbf{R}^n , then these vectors form a basis for H .