## MA 351 Fall 2025 (Aaron N. K. Yip) Homework 6

Due: Thursday, Oct. 30, in class

Penney, Linear Algebra: Ideas and Applications (4th edition)

- p. 92: 1.115, 1.116, 1.117, 1.118, 1.119;
- p. 144: 2.64, 2.65(a,b,c), 2.66(a,c), 2.67(a,c), 2.70, 2.76, 2.78
  - 1. Consider the following  $3 \times 5$  matrix:

$$A = \left[ \begin{array}{ccccc} 1 & 2 & 0 & 1 & -1 \\ 3 & 0 & 1 & 1 & 7 \\ 1 & -4 & 1 & -1 & 9 \end{array} \right].$$

- (a) Find the dimensions of Col(A), Null(A), and Row(A).
- (b) Find a basis for Col(A), Null(A), and Row(A).
- (c) Express each column of A as a linear combination of the basis vector of Col(A) you have found in (b).
- (d) Express each rows of A as a linear combination of the basis vector of Row(A) you have found in (b).
- (e) Do the basis vectors of Col(A) you found in (b) form a basis for  $R^3$ ? If not, find some additional vector(s) so that combined together they do form a basis for  $R^3$ .
- (f) If you combine the basis vectors of Null(A) and Row(A), do they form a basis for  $\mathbb{R}^5$ ? (For simplicity and consistency, you can write the basis vectors for Row(A) as columns, just as those for Null(A).)