Chapter 3.3 & 3.4

Linear Algebra with applications to differential equations

College of the Atlantic. Winter 2019

1. (Re)introduce yourself to others in your group. Briefly share with your group-mates your thoughts about ice/sleet mess we had on Sunday.

2. Use induction to prove that

$$1 + 3 + 5 + \ldots + (2n - 1) = n^2 \,. \tag{1}$$

. . . . . .

3. Consider the following system of linear equations:

$$\begin{aligned} 1x_1 - 2x_2 + 3x_3 + 2x_4 + x_5 &= 10 \\ 2x_1 - 4x_2 + 8x_3 + 3x_4 + 10x_5 &= 7 \\ 3x_1 - 6x_2 + 10x_3 + 6x_4 + 5x_5 &= 27 \end{aligned} \tag{2}$$

   (a) Write the augmented matrix for this system.

   (b) Use elementary row operations to convert the matrix to reduced row echelon form.

   (c) Determine the solution(s) to the linear system.

. . . . . .

4. Write the matrix A in reduced row echelon form:

$$A = \begin{bmatrix} 1 & 2 & 1 & 4 \\ 3 & 8 & 7 & 20 \\ 2 & 7 & 9 & 23 \end{bmatrix} \tag{3}$$

. . . . . .

5. Write each of the following homogeneous systems in matrix form, use row reduction to convert the matrix to reduced echelon form, and then determine all solutions to the system.

$$\begin{aligned} 1x_1 + 2x_2 + 1x_3 &= 0 \\ 3x_1 + 8x_2 + 7x_3 &= 0 \\ 2x_1 + 7x_2 + 9x_3 &= 0 \end{aligned} \tag{4}$$

$$\begin{aligned} 1x_1 + 2x_2 + 3x_3 &= 0 \\ 3x_1 + 4x_2 + 5x_3 &= 0 \\ 4x_1 + 6x_2 + 8x_3 &= 0 \end{aligned} \tag{5}$$