MATH 2568, Spring 2019
Homework 1
Due Wednesday, January 16, 1:50pm.

Homework is due at the beginning of class. Late homework is not accepted. I encourage you to work with others on homework problems, but you must write up your own solutions. Solutions must be presented clearly, or will be marked down.

(1) (§1.1, Exercise 2) Let $x = (2, 1, 3)$ and $y = (1, 1, -1)$, and compute $2x - 3y$.

(2) (§1.1, Exercise 4) Let A be the 3×4 matrix

$$A = \begin{pmatrix} 2 & -1 & 0 & 1 \\ 3 & 4 & -7 & 10 \\ 6 & -3 & 4 & 2 \end{pmatrix}.$$

    (a) For which n is a row of A a vector in $\mathbb{R}^n$?
    (b) What is the 2nd column of A?
    (c) Let a_{ij} be the entry of A in the ith row and the jth column. What is $a_{23} - a_{31}$?

(3) (§1.1, Exercise 7) Let $x = (1, 2, 3)$ and $y = (-2, 1)$. Is $x + y$ possible?

(4) (§1.1, Exercise 10) Let $A = \begin{pmatrix} 2 & 1 \\ -1 & 4 \end{pmatrix}$ and $B = \begin{pmatrix} 0 & 2 \\ 3 & -1 \end{pmatrix}$ and compute $4A + B$.

(5) (§1.2, Exercise 3) Let $x = (1.2, 1.4, -2.45)$ and $y = (-2.6, 1.1, 0.65)$ and use MAT-LAB to compute $3.27x - 7.4y$.

(6) (§1.2, Exercise 5) Let

$$A = \begin{pmatrix} 1.2 & 2.3 & -0.5 \\ 0.7 & -1.4 & 2.3 \end{pmatrix}, \quad B = \begin{pmatrix} -2.9 & 1.23 & 1.6 \\ -2.2 & 1.67 & 0 \end{pmatrix}$$

and use MATLAB to compute $-4.2A + 3.1B$ (include your code in the solution).

(7) (§1.3, Exercise 5) Is the matrix $A = \begin{pmatrix} 3 & 4 & -1 \\ 4 & 3 & 1 \\ -1 & 1 & 10 \end{pmatrix}$ symmetric?

(8) A general 2×2 diagonal matrix has the form $\begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix}$. Thus the two unknown real numbers a and b are needed to specify each 2×2 diagonal matrix. How many unknown real numbers are needed to specify each of the given matrices?
    (a) (§1.3, Exercise 11) An upper triangular 2×2 matrix?
    (b) (§1.3, Exercise 13) An $m \times n$ matrix?
    (c) (§1.3, Exercise 16) A symmetric $n \times n$ matrix?

(9) (§1.3, Exercise 18) True or false? Every diagonal matrix is a multiple of the identity matrix.

(10) (§1.4, Exercise 9) Find a real number a so that the vectors
$$x = (1, 3, 2), \quad y = (2, a, -6)$$
are perpendicular.

(11) (§1.4, Exercise 21) Find the angle (in degrees) between $x = (2, 1, -3, 4)$ and $y = (1, 1, -5, 7)$.