

2017 Fall - Math 355 - Homework 1

Due: Friday, August 25 *in class*.

- (1) Turn the system of equations below into an augmented matrix (careful with the order of the variables!).

(a)

$$\begin{cases} 3x + 2y + z = 1 \\ -y + x - 2 = -z \\ z + 5y + z = -5x \end{cases}$$

(b)

$$\begin{cases} 2y - 2z = 3 \\ 3x - y - 2z = -6 \\ x - y = -3 \\ x + y - 2z = 0 \end{cases}$$

(c)

$$\begin{cases} 2x + w = 4 + y + z \\ x + 1 + y + z = 0 \end{cases}$$

(d)

$$\begin{cases} x_1 - x_2 - x_3 = 1 \\ x_3 - x_2 - x_1 = x_2 \\ 1 + x_1 = x_2 + x_3 \end{cases}$$

- (2) Using row operations, reduce the augmented matrices obtained above into echelon form (you *must* show your work). For the corresponding system of equations, find all solutions.
- (3) Turn the augmented matrices below into systems of linear equations.

$$(a) \left[\begin{array}{ccc|c} 1 & -1 & 0 & 5 \\ 3 & -3 & 2 & -1 \\ 6 & -6 & 1 & 10 \end{array} \right], (b) \left[\begin{array}{ccc|c} 0 & 1 & 0 & 0 \\ 3 & 0 & 0 & 9 \end{array} \right]$$

- (4) Write \vec{i} for the vector $(1, 0, 0) \in \mathbb{R}^3$, \vec{j} for the vector $(0, 1, 0) \in \mathbb{R}^3$, \vec{k} for the vector $(0, 0, 1) \in \mathbb{R}^3$. Let $\vec{v} = (-1, 3, 2)$ and $\vec{w} = (2, 6, -4)$. Compute the following.

(a) $4\vec{v}$

(b) $3\vec{v} - \vec{w}$

(c) $2\vec{w} - 3\vec{i} + 2\vec{k}$

(d) $\vec{v} - (-2, -3\pi + 7, 0)$

(e) $2\vec{v} + 4\vec{j} - \vec{i} - 6\vec{k}$.