

MATH 225 REVIEW PROBLEMS FOR MIDTERM 1

Details: Midterm 1 will take place in class on Tuesday Sept. 23. It will cover the material from sections 1.1 – 1.7. (For section 1.6 you are only responsible for balancing chemical equations.)

Suggested problems from the text, pages 102-104:

- Question 1 minus x, y , and z .
- Questions 2 –19.

Extra Practice Problems:

- (1) (a) If A is an $m \times n$ matrix and x is an n -vector, define Ax in terms of the column vectors of A and the entries of x .
(b) Using your formula from part (a), prove that $A(cx) = c(Ax)$ for any scalar c .
- (2) For what values of h and k is the system of linear equations with the augmented matrix

$$\begin{bmatrix} 1 & h & 1 \\ 5 & 3 & k \end{bmatrix}$$

inconsistent?

- (3) Consider the matrices

$$A_1 = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 2 & 1 & 1 & 1 \\ 3 & 2 & 2 & 0 \end{bmatrix}, \text{ and } A_2 = \begin{bmatrix} 1 & 1 & 1 & 1 \\ 2 & 1 & 1 & 1 \\ 3 & 2 & 2 & 0 \end{bmatrix}.$$

Solve the equations $A_1x = b$ and $A_2x = b$ for

$$(a) \ b = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}, \quad (b) \ b = \begin{bmatrix} 1 \\ 1 \\ 3 \end{bmatrix}, \quad (c) \ b = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}.$$

- (4) Give a geometric description of each of the solution sets from problem (3).
- (5) (a) Define what it means for vectors v_1, \dots, v_p in \mathbb{R}^n to be linearly dependent.

- (b) Determine whether the following vectors are linearly dependent

$$v_1 = \begin{bmatrix} 0 \\ 1 \\ 1 \\ 0 \end{bmatrix}, \quad v_2 = \begin{bmatrix} 1 \\ 0 \\ 1 \\ 2 \end{bmatrix}, \quad v_3 = \begin{bmatrix} 0 \\ 0 \\ 1 \\ 3 \end{bmatrix}.$$