

Midterm 2 - Sample Questions

Honors 140, Section 1

These questions are typical questions which could be asked on an exam. Homework questions are also a good guide.

Question 1

Find all solutions (or explain why there is no solution) of the following system of equations:

$$x + 27 - z = -4$$

$$2x + y + z = 7$$

$$x + 3y + 2z = 7$$

$$x - 3y + z = 9$$

Question 2

Consider the matrix

$$A = \begin{bmatrix} 2 & 1 & 1 \\ 3 & 2 & 1 \\ 2 & 1 & 2 \end{bmatrix}.$$

Find the missing entries in its inverse

$$A^{-1} = \begin{bmatrix} & 3 & & -1 \\ & -4 & 2 & \\ & & 0 & 1 \\ & & & \end{bmatrix}.$$

Question 3

Consider the system of equations

$$2x_1 + 5x_2 = b_1$$

$$x_1 + 3x_2 = b_2.$$

Solve this when (a) $b_1 = 3$, $b_2 = 2$, (b) $b_1 = 0$, $b_2 = 1$, and (c) $b_1 = 1000$, $b_2 = 1000$.

Question 4

Fill in the missing entries where the indicated row operations have been performed:

$$\begin{aligned} \left[\begin{array}{cc|c} 3 & 9 & 6 \\ 2 & 1 & 4 \end{array} \right] &\xrightarrow{\frac{1}{2}R_1} \left[\begin{array}{cc|c} 2 & 1 & 4 \\ & & \end{array} \right] \\ &\xrightarrow{R_2-2R_1} \left[\begin{array}{cc|c} 1 & 3 & 2 \\ & & \end{array} \right] \\ &\xrightarrow{-\frac{1}{5}R_2} \left[\begin{array}{cc|c} 1 & 3 & 2 \\ & & \end{array} \right] \\ &\xrightarrow{R_1-3R_2} \left[\begin{array}{cc|c} 1 & 0 & 2 \\ 0 & 1 & 0 \end{array} \right] \end{aligned}$$

Question 5

Is the matrix

$$\begin{bmatrix} 1 & 1 & -1 & 1 \\ 2 & 1 & 1 & 0 \\ 2 & 1 & 0 & 1 \\ 2 & -1 & -1 & 3 \end{bmatrix}$$

the inverse of the matrix

$$\begin{bmatrix} 3 & 4 & -6 & 1 \\ -2 & -3 & 5 & -1 \\ -4 & -4 & 7 & -1 \\ -4 & -5 & 8 & 1 \end{bmatrix}$$

Question 6

Find the distance between the points $(-2, 7, 3, -1, 0)$ and $(0, 5, 1, 2, -2)$.

Question 7

Find the matrix $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ such that

$$A \begin{bmatrix} 1 & 0 \\ -1 & 3 \end{bmatrix} = \begin{bmatrix} -1 & -3 \\ 3 & 6 \end{bmatrix}$$

Question 8

Calculate

$$\begin{bmatrix} 1 & 3 \\ -1 & 2 \end{bmatrix} \begin{bmatrix} 1 & 3 & 0 \\ 3 & 0 & 2 \end{bmatrix} + \begin{bmatrix} 5 & 1 & 7 \\ 2 & 1 & -1 \end{bmatrix}$$

Question 9

In an experiment, three dice are rolled. Let X be the random variable equal to the sum of the rolls. Find the probability distribution of X . Draw a histogram of the probability distribution of X . Find the expected value and the standard deviation of X .

(This is a little long for an exam question, but shorter ones like it may appear on the exam).

Question 10

The mean annual starting salary of a new graduate in a certain profession is \$ 32,000 with a standard deviation of \$ 500. Estimate the probability that the starting salary of a new graduate is between \$ 30,000 and \$ 34,000.