Linear Systems & STAT – Examination III Review -Solving Matrix Equations

Name: Date: Key Period:

Find the determinant of the given matrices if defined. **(Show your work)**

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

2) $\begin{bmatrix} 4 & -4 \\ 2 & 0 \\ 6 & -3 \end{bmatrix}$ Can't Must be Square

3) $\begin{bmatrix} -4 & 3 & 1 \\ 1 & -6 & 2 \\ -1 & 1 & 4 \end{bmatrix}$ 81

4) $\begin{bmatrix} 7 & 3 & 3 \\ -1 & 1 & -2 \\ -1 & -2 & 2 \end{bmatrix}$ 7

Find the inverses of the above matrices if possible. If not possible **write not possible and why**

5) #1 $\begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix}$

6) #2 Not possible because Not Square

7) #3 $\begin{bmatrix} -24/81 & -11/81 & 9/27 \\ -2/27 & -5/27 & 1/9 \\ -5/81 & 1/81 & -7/27 \end{bmatrix}$

8) #4 $\begin{bmatrix} -2/7 & -12/7 & -9/7 \\ 4/7 & 17/7 & 11/7 \\ 3/7 & 11/7 & 10/7 \end{bmatrix}$

Using the given systems of equations, create a matrix equation

9) $3y - 3z = 4$
$x + 5z = 2$
$4y + z = 11$

$\begin{bmatrix} 0 & 3 & -3 \\ 1 & 0 & 5 \\ 0 & 4 & 1 \end{bmatrix} * \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 4 \\ 2 \\ 11 \end{bmatrix}$

10) $30x + 10y = 155$
$10x - 50y = 325$

$\begin{bmatrix} 30 & 10 \\ 10 & -50 \end{bmatrix} * \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 155 \\ 325 \end{bmatrix}$

Find the solution of the above matrix equations with or without technology

11) #9

$\begin{bmatrix} 0 & 3 & -3 \\ 1 & 0 & 5 \\ 0 & 4 & 1 \end{bmatrix}^{-1} \cdot \begin{bmatrix} 4 \\ 2 \\ 11 \end{bmatrix} = \begin{bmatrix} -11/3 \\ 37/15 \\ 17/15 \end{bmatrix}$

$X = -11/3$ | $Y = 37/15$ | $Z = 17/15$

12) #10

$\begin{bmatrix} 30 & 10 \\ 10 & -50 \end{bmatrix}^{-1} \cdot \begin{bmatrix} 155 \\ 325 \end{bmatrix} = \begin{bmatrix} 55/8 \\ -41/8 \end{bmatrix}$

$X = 55/8$ | $Y = -41/8$

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13) Suppose you want to fill 7 one-kilogram sacks with a holiday snack mix. You plan to buy apples for \$1.29/kg, nuts for \$2.58/kg, and Twinkies for \$1.10/kg. You have \$25.00 and want the mix to contain three times as much of the nuts and apples as of the Twinkies by weight. How much of each ingredient should you buy?

$$\begin{cases} a+n+t=17 \\ 1.29a+2.58n+1.10t=25 \\ a+n=3t \end{cases}$$

→ We want 17 (kg sacks)

→ Apples cost 1.29/kg, Nuts cost \$2.58/kg, Twinkies \$1.10/kg, we have \$25

While # weight of Twinkies to get the weight of Nuts & Apples

a) Explain how each equation in the system above relates to the problem. What do the variables represent?

a = # of kg of Apples n = # of kg of Nuts t = # of kg of Twinkies

b) Create a matrix equation to solve this problem.

$$\begin{bmatrix} 1 & 1 & 1 \\ 1.29 & 2.58 & 1.10 \\ 1 & 1 & -3 \end{bmatrix} \begin{bmatrix} a \\ n \\ t \end{bmatrix} = \begin{bmatrix} 17 \\ 25 \\ 0 \end{bmatrix}$$

$a+n=3t$ → $a+n-3t=0$

c) Solve the matrix equation **and** explain your result

$$\begin{bmatrix} 1 & 1 & 1 \\ 1.29 & 2.58 & 1.10 \\ 1 & 1 & -3 \end{bmatrix}^{-1} \cdot \begin{bmatrix} 17 \\ 25 \\ 0 \end{bmatrix} = \begin{bmatrix} 1.99 \\ 10.76 \\ 4.25 \end{bmatrix}$$

Apples = 1.99 kg
Nuts = 10.76 kg
Twinkies = 4.25 kg

14) Using a determinant find the area of a triangle with the given vertices

(−5 , 4) (1 , 6) and (3 , 2)

$$\det \begin{bmatrix} -5 & 4 & 1 \\ 1 & 6 & 1 \\ 3 & 2 & 1 \end{bmatrix} = -28$$

$\frac{1}{2}|-28| =$ 14 sq units

15) Write a system of equations for the following word problem. Using that system of equations, write a matrix equation.

A baker is making bread. He wants to make 100 pans of bread. The kitchen has two sizes of ovens. One oven bakes 4 pans at a time and the other oven bakes 12 pans at a time. The kitchen can use 10 ovens at a time. How many times will each oven be used in order to bake the 100 pans of bread?

B = Big oven # of Times
S = # of Small ovens used

$4S+12B=100$
$S+B=10$

$$\begin{bmatrix} 4 & 12 \\ 1 & 1 \end{bmatrix} \cdot \begin{bmatrix} S \\ B \end{bmatrix} = \begin{bmatrix} 100 \\ 10 \end{bmatrix}$$

$$\begin{bmatrix} 4 & 12 \\ 1 & 1 \end{bmatrix}^{-1} \cdot \begin{bmatrix} 100 \\ 10 \end{bmatrix} = \begin{bmatrix} 0 \\ 10 \end{bmatrix}$$

No Small & 10 Big Times