Week in Review # 2

MATH 141 drost-Spring 2010

1.5,2.1,2.4,2.5

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1. Find a straight line which best models the following data:

Birth Weight (lbs)	7.5	9.4	9.1	6.75	7.1	5.8
Length (inches)	19.5	21.5	20	19	20.5	18.1

   a) Use the result to estimate the length of a newborn who weighed 9lb 4ozs.

   b) Is this a good estimate? why or why not?

   c) According to this model, what happens when the length increases 1 inch?

2. The following data relates x, annual miles driven in thousands, and y, the cost per mile in cents, of operating a new car.

x	5	10	15	20	25	30	35
y	50.3	34.8	30.1	27.4	25.6	23.5	21.8

   a) assuming a linear relationship, find the best-fitting line.

   b) use the results to estimate the cost per mile of operating a new company car if it is driven 12,000 miles during the firsst year of ownership.

3. The median price of homes in thousands of dollars in a certain city from 1985 to 2000 was:

Year	1985	1988	1992	1995	1998	2000
Price	68.2	70.2	76.1	79.5	85.1	89.9

   a) Using 1985 as t=0, and assuming a linear relationship, find the equation which best fits the data provided.

   b) Using this model, predict the median price for the year 2003, to the nearest thousand.

4. Rudder Theatre has a seating capacity of 1000 people, and charges \$5 for children, \$8 for students and \$12 for adults. At a recent function with full attendance, there were sixteen times as many students as children. The number of students was four times the number of adults and children combined. Write a system of equations which describes the data.

5. Samuel Jones has \$20,000 to invest in two accounts, with account A yielding $8\frac{1}{2}\%$ and account B yielding 11.25%. Write a system of equations given that the annual interest earned is \$1810.

6. Determine whether the following systems have only one solution, infinitely many solutions, or no solutions. Find all solutions when they exist.

   a) $\begin{cases} \frac{5}{4}x - \frac{2}{3}y = 16 \\ \frac{1}{4}x - \frac{5}{3}y = -4 \end{cases}$

   b) $\begin{cases} 5x + 7.5y = -30 \\ -2x - 3y = 12 \end{cases}$

7. Find the value(s) of k for which the following system has:

   a) no solution

$$\begin{cases} 3x - y = 12 \\ 6x - 2y = k \end{cases}$$

   b) an infinite number of solution

$$\begin{cases} 3x - y = 12 \\ 2x + ky = 8 \end{cases}$$

8. a. Write the following system of equations as an augmented matrix.

$$\begin{cases} 2x + 3y + 5z = 6 \\ 3x - y - 3z = 11 \\ x + y + z = 1 \end{cases}$$

   b. Solve the system using Gauss-Jordan elimination method.

9. Solve problem #4 using Gauss-Jordan elimination method.

10. a. Write the following system of equations as an augmented matrix.

$$\begin{cases} 4x - 4z = 0 \\ 2y - 4z = 6 \\ 2x - y = -3 \end{cases}$$

b. Solve the system using Gauss-Jordan elimination method. If the system has an infinite number of solutions, write three possible solutions.

11. a. Write the following system of equations as an augmented matrix.

$$\begin{cases} 2x + y = 12 \\ 3x - y = 10 \\ x + y = -2 \end{cases}$$

b. Solve the system using Gauss-Jordan elimination method. If the system has an infinite number of solutions, write three possible solutions.

Given matrix $A = \begin{bmatrix} 2 & 3 & -1 \\ 4 & 5 & 6 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 2 \\ 3 & -1 \\ 0 & 4 \end{bmatrix}$, $C = \begin{bmatrix} -1 & 1 & 2 \\ 0 & -4 & -3 \end{bmatrix}$, $D = \begin{bmatrix} 1 & 2 & \triangle \\ 4 & -2 & 0 \end{bmatrix}$

12. Find A - C

13. Find A + C

14. Find A^T

15. Find $A \cdot B$

16. Find $D \cdot B$

17. Orders were received for the following: 40 regular burritos on wheat, 50 monster burritos on cayenne, and 36 regular burritos on spinach.

The order will be filled at three locations as outlined below.

$$O = \begin{bmatrix} \text{location} & \text{reg/wheat} & \text{monster/cayene} & \text{reg/spinach} \\ \text{I} & 20 & 15 & 10 \\ \text{II} & 15 & 10 & 20 \\ \text{III} & 5 & 25 & 6 \end{bmatrix}$$

The ingredients needed for the various orders are as outlined below: (units are cups except for the tortillas)

$$I = \begin{bmatrix} \text{ingredients} & \text{rice} & \text{cheese} & \text{wheat} & \text{cayene} & \text{spinach} & \text{chicken} & \text{tomatoes} \\ \text{regular/wheat} & .5 & .5 & 1 & 0 & 0 & .5 & .5 \\ \text{monster/cayene} & 1 & .75 & 0 & 1 & 0 & 1 & 1 \\ \text{regular/spinach} & .5 & .5 & 0 & 0 & 1 & .5 & .5 \end{bmatrix}$$

The prices of the various ingredients per unit is listed below.

$$P = \begin{bmatrix} \text{ingregients} & \$/\text{serving} \\ \text{rice} & .25 \\ \text{cheese} & .50 \\ \text{wheat tortilla} & .05 \\ \text{cayene tortilla} & .08 \\ \text{spinach tortilla} & .09 \\ \text{chicken} & 1.25 \\ \text{tomatoes} & .30 \end{bmatrix}$$

Label the matricies O (for order), I (for ingredients), and P (for prices), and answer the following questions:

a) find $O \cdot I$ and explain what it represents.

b) find $(O \cdot I) \cdot P$ and explain what it represents.

Given the following prices for each item on the menu, build another matrix, and label it D (for dollars):

$$D = \begin{bmatrix} \text{regular/wheat} & 4.25 \\ \text{monster/cayene} & 5.00 \\ \text{regular/spinach} & 4.25 \end{bmatrix}$$

c) find $O \cdot D$ and explain what it represents.

d) find $O \cdot D - (O \cdot I) \cdot P$ and explain what it represents.

18. If $A \cdot B = 0$, where A and B are matricies, is it true that A = 0 or B = 0 ?

19. Find A such that:

$$A \cdot \begin{bmatrix} 2 & 1 \\ -3 & 0 \end{bmatrix} = \begin{bmatrix} -4 & 1 \\ -6 & 3 \end{bmatrix}$$

20. The figure below shows the traffic flow around Park Central. The arrows indicate the direction of traffic flow on each one-way road, and the average number of vehicles per hour entering and leaving each intersection appears beside each road.

    a. Write a general expression for traffic flow, in terms of x_1, x_2, x_3, and x_4.

    b. Find a possible flow pattern that will not cause congestion.