

Fall 2006  
Math 141 Week-in-Review #3  
Exam 1 Review

*courtesy: Kendra Kilmer*  
(covering Chapters 1 and 2)

(Please note that this review is not all inclusive)

- Find the equation of the line that passes through the point  $(-1, 3)$  and is perpendicular to the line passing through the points  $(2, 5)$  and  $(7, -9)$ .
- A printer is purchased in 2006 for \$25,000. It has been determined that this printer will be depreciated linearly over a 15 year period. If it is known that the book value of the printer is \$15,000 in 2014, what is the scrap value of this printer?
- At a unit price of \$5, consumers in College Station will demand 15,000 Maroon Out T-Shirts. But for each \$1 increase in price, they will demand 2,000 fewer T-shirts. The suppliers of the Maroon Out T-Shirts will not produce any T-shirts if the selling price is below \$3, but at a unit price of \$8, they are willing to supply 30,000 T-shirts. What is the market equilibrium for Maroon Out T-shirts?
- The table below represents the population at Storyville High in 1000's of people, since the year 1998.

Year	1998	2001	2004	2005
Population	0.179	0.862	1.246	1.358

- Find the equation of the least squares line. Let  $x$  represent the years since 1998 and let  $y$  represent the population in 1000's of people. Round your values to four decimal places.
  - Using your rounded equation from part (a), what will the population at Storyville High be in 2009. (Round your answer to the nearest person)
  - Using your rounded equation from part (a), when will the population at Storyville High reach 3,000? (Round your answer to the nearest year)
- At the Austin City Limits Music Festival, a three day event held on Friday, Saturday, and Sunday, YoSoy Candle Company managed to sell \$2400 worth of candles. Amazingly, the sales made Sunday ended up being the same as the combined sales for Friday and Saturday. Even more astonishing, the sales made Sunday were three times the amount of sales made Friday. What were YoSoy's total sales for each day of the festival?
  - Solve the following system of linear equations by doing Gauss-Jordan Elimination by hand.

$$2x - 7y = 9$$

$$y = -3x + 5$$

- Each of the following augmented matrices represents a system of linear equations. Determine whether or not the augmented matrix is in row-reduced form. If it IS in row-reduced form give the solution to the system of linear equations. If it IS NOT in row-reduced form, perform the next row operation that would need to be performed to get the augmented matrix in row-reduced form.

$$(a) \left[ \begin{array}{cccc|c} 1 & 0 & 0 & 0 & 4 \\ 0 & 1 & 2 & 0 & -3 \\ 0 & 0 & 0 & 1 & 2 \end{array} \right]$$

$$(b) \left[ \begin{array}{cc|c} 1 & 0 & 8 \\ 0 & 1 & -7 \\ 0 & 0 & 15 \end{array} \right]$$

$$(c) \left[ \begin{array}{ccc|c} 1 & 0 & -2 & 5 \\ 0 & 1 & 0 & -7 \\ 0 & 0 & 1 & 6 \\ 0 & 0 & 0 & 0 \end{array} \right]$$

- Given the following matrices with the indicated dimensions, which of the following are valid matrix operations?

$$A_{3 \times 2}, B_{4 \times 2}, C_{2 \times 3}, D_{3 \times 4}$$

$$(a) AB^T - 6D$$

$$(b) C - DB$$

$$(c) AC^T$$

$$(d) 5D + 3B$$

- Let  $A = \begin{bmatrix} 2 & -7 \\ s & 5 \end{bmatrix}$ ,  $B = \begin{bmatrix} 4 & 9 & -4 \\ -5 & 1 & 3 \end{bmatrix}$ ,  $C = \begin{bmatrix} 43 & 11 & t \\ -25 & 5 & 15 \end{bmatrix}$   
If  $AB = C$ , find the values of  $s$  and  $t$ .

- The Crazy Cat Food Company makes three types of cat food: Meow Mix, Kitty Kibbles, and Fishy Flavor. The company produces the cat food in Texas, California, and Wyoming using two main ingredients, fish and chicken.

- Each bag of Meow Mix requires 2 ounces of fish and 3 ounces of chicken. Each bag of Kitty Kibbles requires 2 ounces of fish and 2 ounces of chicken. Each bag of Fishy Flavor requires 3 ounces of fish and 2 ounces of chicken. Put this information into a  $2 \times 3$  matrix.

- The cost of 1 ounce of fish is \$0.75 in Texas, \$0.50 in California and \$1 in Wyoming. The cost of 1 ounce of chicken is \$0.25 in Texas, \$1.00 in California and \$0.75 in Wyoming. Put this information into a matrix in such a way that when it is multiplied by the matrix in part **a**) it will tell us the cost of producing a bag of each variety of cat food in each city. Find the resulting product matrix.

- Determine whether each of the following statements is True or False.

- It is possible for a  $3 \times 4$  matrix to have an inverse.
- If a matrix has an inverse, then we say the matrix is non-singular.
- In solving the matrix equation  $AX = B$  which represents a system of linear equations, if the matrix  $A$  is singular, we can conclude that the system of linear equations has no solution.
- A matrix multiplied by the appropriate identity matrix results in the original matrix.

- Solve the following system of linear equations using inverses.

$$3x - 8y + 9z = 7$$

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

$$x - 2y + 4z = 3$$

- Consider a simple economy consisting of three sectors: food, clothing, and shelter. The production of 1 unit of food requires the consumption of 0.2 unit of food, 0.3 unit of clothing, and 0.1 unit of shelter. The production of 1 unit of clothing requires the consumption of 0.2 unit of food, 0.3 unit of clothing, and 0.2 unit of shelter. The production of 1 unit of shelter requires the consumption of 0.2 unit of food, 0.2 unit of clothing, and 0.1 unit of shelter. Find the level of production for each sector in order to satisfy the demand for \$150 million worth of food, \$40 million worth of clothing, and \$350 million worth of shelter. (Round your answers to 2 decimal places.)