Math 105Q  Exam 1  Version 1  Sept. 17, 2002

Name: ___________________________  Section: ___  Instructor: _________________

Instructions: This is a closed notes, closed book exam. You can not receive aid on this exam from anyone else - No sharing of calculators! If you have a question, ask your instructor. Make sure your exam has 5 pages. The last page is for scrap.

• Multiple choice questions have no partial credit. For the others, some partial credit will be given depending on the work submitted. On these questions you must show all work and calculations needed to reach your answers. Just using a calculator is not sufficient for credit.

1. (4 pts.) The slope of the line through (−4, 3) and (6, 1) is:
   a) $\frac{-1}{5}$    b) −5    c) $\frac{1}{5}$    d) 5

2. (4 pts.) Find the slope of the line given by $6x - 3y = 7$.
   a) 2    b) $\frac{1}{2}$    c) −2    d) $-\frac{1}{2}$

3. (5 pts.) Write the equation, in slope-intercept form, of the line passing through the point (−2, 7) and perpendicular to the line $y = \frac{2}{3}x - 1$. Show your work.

4. (6 pts.) The quantity demanded of a certain brand of videocassette recorder (VCR) is 3000/week when the unit price is $485. For each decrease in unit price of $20 below $485, the quantity demanded increases by 250/week. Find the weekly demand equation. Show your work.
5. (4 pts.) Which of the following graphs more closely depicts the graph of \( y - a = \frac{2}{3}(x + 1) \), where \( a \) is a positive number.

a) ![Graph A]  b) ![Graph B]  c) ![Graph C]  d) ![Graph D]

6. (4 pts.) The slope of a vertical line is

a) positive  b) negative  c) zero  d) undefined

7. (5 pts.) Origin’s Café is going to start to sell two kinds of coffee beans: Jamaican and Columbian. The Jamaican will sell for $8 per pound and the Columbian for $10 per pound. If the total revenue in sales on one day $380, what equation relates the amounts of each type of coffee sold?

a) \( 8x + 10y = 380 \)  
   \( x = \) No. of lbs of Columbian  
   \( y = \) No. of lbs of Jamaican  

b) \( 10x + 8y = 380 \)  
   \( x = \) No. of lbs of Columbian  
   \( y = \) No. of lbs of Jamaican  

c) \( 8x - 10y = 380 \)  
   \( x = \) No. of lbs of Jamaican  
   \( y = \) No. of lbs of Columbian  

d) \( 10x - 8y = 380 \)  
   \( x = \) No. of lbs of Jamaican  
   \( y = \) No. of lbs of Columbian

For problems 8 and 9:

Assume that \( x \) is the number of items made and sold and that the cost and revenue equations are linear. Suppose that the per item variable costs are $15 with monthly fixed costs of $2,000 and a per item sale price of $32.

8. (5 pts.) The cost equation is:

a) \( C = 15x \)  
b) \( C = 32x + 2,000 \)  
c) \( C = 15x + 2000 \)  
d) \( C = 32x \)

9. (5 pts.) The profit equation is:

a) \( P = 32x \)  
b) \( P = 17x + 2000 \)  
c) \( P = 17x - 2000 \)  
d) \( P = 32x - 2000 \)
10. (8 pts.) Suppose that the supply function is \( p = 0.123x + 50 \) and the demand function is \( p = -0.377x + 270 \) for a certain type of orange, where \( x \) is in thousands of tons and \( p \) is in millions of dollars. Find the number of tons of oranges sold and the price that they should be sold at in order to have the supply and demand in equilibrium. Show your work.

\[ x = \]

\[ p = \]

11. (4 pts.) Given the following system of equations,
\[
\begin{align*}
    x + 3y + 4z &= 12 \\
    -2x + y - 2z &= 7 \\
    3x + 5z &= 9
\end{align*}
\]
Which of the following is the augmented matrix corresponding to this system?

a) \[
\begin{bmatrix}
    3 & 1 & 4 & 12 \\
    1 & -2 & -2 & 7 \\
    0 & 3 & 5 & 9
\end{bmatrix}
\]

b) \[
\begin{bmatrix}
    1 & 3 & 4 & 12 \\
    -2 & 1 & -2 & 7 \\
    5 & 0 & 3 & 9
\end{bmatrix}
\]

c) \[
\begin{bmatrix}
    1 & 3 & 4 & 7 \\
    -2 & 1 & -2 & 9 \\
    3 & 0 & 5 & 12
\end{bmatrix}
\]

d) \[
\begin{bmatrix}
    1 & 3 & 4 & 12 \\
    -2 & 1 & -2 & 7 \\
    3 & 0 & 5 & 9
\end{bmatrix}
\]

12. (4 pts.) Using the Guass-Jordan Method as discussed in class, which operation would be the next operation performed on the augmented matrix below
\[
\begin{bmatrix}
    1 & -2 & 3 & -4 \\
    0 & 5 & 4 & 6 \\
    3 & 2 & -1 & 2
\end{bmatrix}
\]
in solving the corresponding system of linear equations.

a) \( 2R_1+R_2 \rightarrow R_2 \)

b) \( 3R_1+R_2 \rightarrow R_3 \)

c) \( -3R_1+R_3 \rightarrow R_3 \)

d) \( -3R_1+R_3 \rightarrow R_2 \)

13. (6 pts.) Write the solution(s) for the three equations in \( x, y \) and \( z \) represented by each of the following augmented matrix, if they exists. Show your work.
\[
\begin{bmatrix}
    1 & 0 & 7 & 2 \\
    0 & 1 & -3 & -2 \\
    0 & 0 & 5 & 10
\end{bmatrix}
\]
14. (6 pts.) Write the solution(s) for the three equations in $x, y$ and $z$ represented by each of the following augmented matrix, if they exists. Show your work.

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

15. (6 pts.) Perform the following matrix operations if possible:

$$
\begin{bmatrix}
3 & -3 & 2 & 0 \\
4 & 0 & -2 \\
\end{bmatrix} -
\begin{bmatrix}
-10 & 4 & 2 \\
5 & 2 & 10 \\
\end{bmatrix} = \ldots
$$

a) $\begin{bmatrix} 1 & 2 & -2 \\ 7 & -2 & -16 \end{bmatrix}$   

b) $\begin{bmatrix} 1 & 2 & 1 \\ 7 & 1 & -16 \end{bmatrix}$

c) $\begin{bmatrix} -19 & 10 & 2 \\ 17 & 2 & 4 \end{bmatrix}$

d) can not be done

16. (4 pts.) Which of the following is not a possibility when solving a system of linear equations?

a) there is one unique solution    

b) there are infinitely many solutions

c) there are no solutions

d) there are exactly two solutions

17. (4 pts.) Which of the following is not possible?

a) $\begin{bmatrix} 7 & 1 \end{bmatrix} \cdot \begin{bmatrix} 2 \\ 3 \end{bmatrix}$

b) $\begin{bmatrix} 2 \\ 3 \end{bmatrix} \cdot \begin{bmatrix} 7 & 1 \end{bmatrix}$

c) $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} \cdot \begin{bmatrix} 7 & 0 & 3 & 2 \\ 1 & -1 & 2 & 3 \\ 2 & -2 & 0 & 1 \end{bmatrix}$

d) $\begin{bmatrix} 7 & 0 & 3 & 2 \\ 1 & -1 & 2 & 3 \\ 2 & -2 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix}$

18. (4 pts.) Which one of the following is not true about matrices, in general, assuming that all the sizes match up appropriately?

a) $A + B = B + A$

b) $A + (B + C) = (A + B) + C$

c) $A \cdot B = B \cdot A$

d) $A \cdot (B \cdot C) = (A \cdot B) \cdot C$

19. (4 pts.) Is the matrix $\begin{bmatrix} 2 & 2 \\ 3 & 4 \end{bmatrix}$ the inverse of $\begin{bmatrix} 2 & -1 \\ -1.5 & 1 \end{bmatrix}$?

a) Yes    

b) No
20. (8 pts.) Find the inverse to the matrix \[
\begin{bmatrix}
1 & 0 & 3 \\
2 & 1 & -2 \\
0 & 0 & 1 \\
\end{bmatrix},
\] using the Guass-Jordan method. Be sure to indicate what row operations you are using. Show your work.

\textbf{Scrap:} This page is for scrap work and extra room. No work on this page will be considered for grading unless specifically referenced at the appropriate location on the preceding pages.