

Math 141
Exam I
Spring 2009
Scarborough
FORM A

NEATLY PRINT NAME: _____

STUDENT ID: _____

DATE: _____

SECTION: 522 (9:10am) 523 (10:20am) 514 (11:30am) 814 (11:30am)

"On my honor, as an Aggie, I have neither given nor received unauthorized aid on this academic work."

Signature of student

Academic Integrity Task Force, 2004

<http://www.tamu.edu/aggiehonor/FinalTaskForceReport.pdf>

My signature in this blank allows my instructor to pass back my graded exam in class or allows me to pick up my graded exam in class on the day the exams are returned. If I do not sign the blank or if I am absent from class on the day the exams are returned, I know I must show my Texas A&M student ID during my instructor's office hours to pick up my exam.

Signature of student _____

Multiple Choice: On your Scantron Form No. O-101607-TAMU write and bubble in your LAST NAME, FIRST NAME, MI (MIDDLE INITIAL), DEPT (MATH), COURSE (141), SECTION, TAMU UNIVERSAL ID NUMBER (UIN), and TEST FORM A. On the Scantron also write in your instructor's name, sign your name, write today's date and write Exam I in the appropriate blank. Bubble in your answers to the multiple-choice questions # 1 – 10 on your Scantron. The Scantron will not be returned so also mark all your answers on this test paper. There is no partial credit on the multiple-choice questions. *Five points will be deducted for having no Scantron, having the wrong Scantron, having a mutilated Scantron, and/or for not correctly and completely filling in the Scantron.*

Work Out: Write all solutions in the space provided as full credit will not be given without complete, correct accompanying work, even if the final answer is correct. Fully simplify all your answers, and give exact answers unless otherwise stated. Justify your answers algebraically whenever possible; state any special features or programs you use on your calculator. Remember your units! Make sure that you indicate your answer clearly by circling your response.

Clear your calculator before and after your exam. **MEM (2nd +), Reset, ALL, Reset**
To turn on the correlation coefficient: **Catalog (2nd 0), DiagnosticOn, Enter, Enter**

1. (5 pts) Which of the following lines is perpendicular to the line $7x+3y=1$?

- a. $14x+6y=9$
- b. $14x-6y=9$
- c. $6x+14y=9$
- d. $6x-14y=9$
- e. None of these

2. (5 pts) Solve for X in the following matrix equation. Assume all dimensions are compatible and all matrix algebra is defined.

$$7X + XR - S = Q$$

- a. $X = \frac{Q+S}{7I+R}$
- b. $X = (Q+S)(7I+R)^{-1}$
- c. $X = (7+R)^{-1}Q+S$
- d. $X = (7I+R)^{-1}(Q+S)$
- e. None of these

3. (5 pts) A company selling flower pots has a profit function of $P(x) = 2x - 500$, where x is the number of flower pots made and sold, and profit is given in dollars. If the company sells the flower pots for \$3 each, find the break-even revenue.

- a. \$0
- b. \$250
- c. \$500
- d. \$750
- e. None of these

4. (5 pts) For what value of k would the augmented matrix below be in reduced row echelon form?

$$\left[\begin{array}{cccc|c} 1 & 0 & 12 & 0 & -3 \\ 0 & 1 & k & 0 & -9 \\ 0 & 0 & 0 & 1 & -11 \end{array} \right]$$

- a. Any value for k is acceptable
- b. No value for k is acceptable
- c. $k = 0$
- d. $k = 1$
- e. None of these

5. (5 pts) This table gives the dimensions and characteristics of five matrices.

Matrix	Dimensions
M , singular	3×3
N	3×5
P	7×3
Q	5×3
R , non-singular	5×5

Which of the following matrix operations is defined?

- $(7N^T + 3Q)^{-1}$
- $I_5Q - 8N$
- $Q^T R^{-1} + 5N$
- $(PM^{-1})(NI_5)$
- None of these

6. (5 pts) Matrix H shows the number of milligrams of vitamins A, C and E in a single serving of salami, olives and carrots. Given that Jordan ate 3 servings of salami, 8 servings of olives and 5 servings of carrots for a snack, find a matrix J such that the product of J and H will give matrix T with the total amount of vitamins A, C and E that Jordan had in her snack.

$$H = \begin{matrix} & \begin{matrix} \text{A} & \text{C} & \text{E} \end{matrix} \\ \begin{matrix} \text{Salami} \\ \text{Olives} \\ \text{Carrots} \end{matrix} & \begin{bmatrix} 21 & 0 & 16 \\ 4 & 4 & 87 \\ 99 & 51 & 1 \end{bmatrix} \end{matrix}$$

- $T = HJ$ with $J = \begin{bmatrix} 3 & 8 & 5 \end{bmatrix}$
- $T = JH$ with $J = \begin{bmatrix} 3 & 8 & 5 \end{bmatrix}$
- $T = HJ$ with $J = \begin{bmatrix} 3 \\ 8 \\ 5 \end{bmatrix}$
- $T = JH$ with $J = \begin{bmatrix} 3 \\ 8 \\ 5 \end{bmatrix}$
- None of these

7. (5 pts) The Red Deck will not supply a gross of playing cards if the price per gross of the product is \$85. However, the company will increase the number of gross quantities supplied by 500 for every \$15 increase in the price. Determine the price when 3500 gross quantities are supplied.

- a. \$190
- b. \$85
- c. \$116,752
- d. \$405
- e. None of these

8. (5 pts) Determine the solution to the following system of equations.

$$x + 10y + 3z = 2$$

$$2x - 6y - z = 0$$

$$3x + 4y + 2z = 0$$

- a. $\left(\frac{4}{13}, \frac{7}{26}, 1\right)$
- b. $\left(\frac{-4}{13}t, \frac{-7}{26}t, t\right)$, where t is any real number
- c. No solution
- d. $\left(\frac{4}{13}t, \frac{7}{26}t, t\right)$, where t is any real number
- e. None of these

9. (5 pts) If $A = \begin{bmatrix} -2 & x \\ 0 & 3 \\ 4 & 9 \end{bmatrix}$ and $B = \begin{bmatrix} x & y & 1 \\ -5 & -4 & 0 \end{bmatrix}$, such that $C = BA$, find c_{12} .

- a. -10
- b. This product is undefined.
- c. $-2y - 4x$
- d. $x^2 + 3y + 9$
- e. None of these

10. An online auction site recorded the average of the winning bids on 22-inch LCD TVs each month from March 2008 to August 2008. The results are summarized in the table below.

Month	March	April	May	June	July	August
Average Winning Bid (\$)	\$280	\$275	\$263	\$260	\$245	\$241

- a. (3 pts) Determine the equation of the least-squares line for this data, where x is the number of months since March 2008. If necessary, round your coefficients to two decimal places. This is a workout problem, so write your answer in the space below.
- b. (5 pts) Use the *unrounded* model to predict the month and year in which the average winning bid will be \$230.00. Mark this answer on your Scantron for problem 10.
- September 2008
 - October 2008
 - November 2008
 - December 2008
 - None of these
- c. (2 pts) To two decimal places, what is the correlation coefficient for the least-squares line for this data? This is a workout problem, so write your answer in the space below.

11. (8 pts) Solve the following system of equations. If the system has an infinite number of solutions, then write the solution set in parametric form.

$$2x - 3z = -18 - 2y$$

$$3z = 2y + 12$$

$$4x + 2y - 3z + 24 = 0$$

15. (7 pts) Set up, but DO NOT SOLVE, a system of equations that can be used to solve the following problem. Be sure to clearly define your variables.

The W. Talbert Finance Company has allocated \$1,914,000 annually to pay for the salaries of new administrative staff, customer representatives, and managers. The company wishes to hire a total of 52 new employees, and they wish to have four times as many administrative staff hires as manager hires. Each administrative staff position pays an annual salary of \$26,000, each customer representative position pays \$42,000, and each local manager position pays \$76,000. How many of each type of employee should W. Talbert Finance Company hire to use all allocated funds?

16. (8 pts) A simple economy consists of fishermen and weavers. To harvest one unit of fish requires the consumption of 0.4 units of fish and 0.2 units of woven material. To produce one unit of woven material requires 0.3 units of fish and 0.1 units of woven material. Find the gross output of fish and woven material to satisfy an external consumer demand for 216 units of fish and 96 units of woven cloth.

_____ units of fish _____ units of woven material