

Quiz 6

Linear Systems

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Time Begun: \_\_\_\_\_

Time Ended: \_\_\_\_\_

Friday March 10

Ron Buckmire

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**Topic :** Subspaces Associated With Matrices

The idea behind this quiz is for you to indicate your understanding of the column space and row space associated with a matrix.

**Reality Check:**

EXPECTED SCORE : \_\_\_\_\_/10

ACTUAL SCORE : \_\_\_\_\_/10

**Instructions:**

1. Please look for a hint on this quiz posted to [faculty.oxy.edu/ron/math/214/06/](http://faculty.oxy.edu/ron/math/214/06/)
2. You may use the book or any of your class notes. You must work alone.
3. If you use your own paper, please staple it to the quiz before coming to class. If you don't have a stapler, buy one. QUIZZES WITH UNSTAPLED SHEETS WILL NOT BE GRADED.
4. After completing the quiz, sign the pledge below stating on your honor that you have adhered to these rules.
5. Your solutions must have enough details such that an impartial observer can read your work and determine HOW you came up with your solution.
6. Relax and enjoy...
7. **This quiz is due on Monday March 20**, in class. NO LATE OR UNSTAPLED QUIZZES WILL BE ACCEPTED.

**Pledge:** I, \_\_\_\_\_, pledge my honor as a human being and Occidental student, that I have followed all the rules above to the letter and in spirit.

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1. Consider the system of equations  $\begin{bmatrix} b & 3 \\ 4 & 6 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -3 \\ 6 \end{bmatrix}$  where  $b$  is an unknown parameter.
- a. (4 points). If  $b = 2$  what are the column space and the nullspace of the coefficient matrix  $A = \begin{bmatrix} 2 & 3 \\ 4 & 6 \end{bmatrix}$ ? Write expressions describing these subspaces. Also give the rank of  $A$ , the dimension of the nullspace and the dimension of the column space.

- b. (4 points). If  $b = 1$  how do the column space and nullspace of the coefficient matrix  $A = \begin{bmatrix} 1 & 3 \\ 4 & 6 \end{bmatrix}$  change from your answer in (a)? Write down the rank of  $A$ , the dimension of the nullspace and the dimension of the column space.

- c. (2 points). How does the rank of the coefficient matrix  $\begin{bmatrix} b & 3 \\ 4 & 6 \end{bmatrix}$  depend on the value of  $b$ ? Use this information to determine for what values of  $b$  the system has 1 unique solution and explain how you know the solution will be unique for these values of  $b$ .