Assignment 4

Due Date: 10 May 2015

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Determine whether the statement is true or false:

1. A linear transformation preserves the operations of vector addition and scalar multiplication. (True).
2. If the linear transformation is both one-to-one and onto, then it is an isomorphism. (True).
3. If we interchange two rows in an identity matrix, then it will not have an LU-decomposition. (True).
4. Every square matrix has an LU-decomposition. (False).
5. LU decompositions are unique. (False).
6. Simplex method is an iterative procedure for solving LPP in finite number of steps. (True).
7. The solution set of a system of linear equation is bounded if it can be enclosed by a circle. (True).

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For Each Question, Choose the Correct Answer from the Multiple-Choice List.

1. One of the following matrices has no LU-decomposition

 c) d)

1. Let  be a linear transformation, then:
2. The kernel of is a subspace of
3. The kernel of is a subspace of
4. The range of is a subspace of
5. None.
6. Graphical method can be applied to solve LPP when there are only:
7. One variable.
8. Two variables.
9. Three variables.
10. None.
11. Let  be the multiplication by  then will be equal to:
12. *T*− 1(*x*, *y*) = (*x* – 2*y*, − 2*x* + 3/2*y*)
13. *T*− 1(*x*, *y*) = (*x* – 1/2*y*, − 2*x* + 5*y*)
14. *T*− 1(*x*, *y*) = (*x* – 1/2*y*, − 2*x* + 3/2*y*)
15. *T*− 1(*x*, *y*) = (*x* – 1/2*y*, 2*x* + 3/2*y*)

Solve the following questions:

1. Determine whether the function

, where is linear?

Hint: check if this transformation preserves additivity.

 Solution:

 We have

 So, T does not preserve additivity. So, T is not linear.

1. Let

Write down the standard matrix of , and compute

Solution:

A=

1. Find an LU-decomposition of the following matrix:

Solution:

,

So .

Note: factorization is not unique.

.

1. Find the singular values of the matrix A if given the following matrix:

 .

Solution:

The characteristic equation for the matrix is:

.

The eigenvalues are 1,2 and 3.

Then the singular values of A are 1, ,and .

1. Using graphical method to solve the Linear Programming Problem.

Maximize

 Subject to

Solution:



|  |  |
| --- | --- |
| Coordinates |  |
| (0,0) |  |
| (0,4) |  |
| (4,0) |  |
| (3,2) |  |

The maximum value is at the point