

Math 2802 N1-N3 Worksheet 4

February 2nd, 2018

1. Consider a transformation $T : \mathbf{R}^n \rightarrow \mathbf{R}^m$. Choose the correct answer and give examples in the follow up questions.

a) We guarantee that

- T is not onto if $m > n$.

Follow up: Provide 2 examples of $T : \mathbf{R}^3 \rightarrow \mathbf{R}^2$ where i) T is onto ii) T is not onto.

- T is not onto if $m < n$.

Follow up: Provide 2 examples of $T : \mathbf{R}^2 \rightarrow \mathbf{R}^3$ where i) T is onto ii) T is not onto.

b) We guarantee that

- T is not one-to-one if $m > n$.

Follow up: Provide 2 examples of $T : \mathbf{R}^3 \rightarrow \mathbf{R}^2$ where i) T is one-to-one ii) T is not one-to-one.

- T is not one-to-one if $m < n$.

Follow up: Provide 2 examples of $T : \mathbf{R}^2 \rightarrow \mathbf{R}^3$ where i) T is one-to-one ii) T is not one-to-one.

2. Let $A_3 = \begin{pmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 1 & 1 \end{pmatrix}$ and $A_4 = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 \\ 1 & 1 & 1 & 1 \end{pmatrix}$.

a) Compute the inverse of A_3 using the algorithm from class.

b) Can you guess the inverse of A_4 ?

c) Can you guess the inverse of the corresponding A_n ?

3. If we know that

$$A = \begin{pmatrix} 5 & 2 & -1/2 \\ -3/2 & -7/10 & 1/5 \\ -1/2 & -1/10 & 1/10 \end{pmatrix} \quad \text{and} \quad A^{-1} = \begin{pmatrix} 1 & 3 & -1 \\ -1 & -5 & 5 \\ 4 & 10 & 10 \end{pmatrix}$$

Solve the system $Ax = \begin{pmatrix} 1 \\ 0 \\ -3 \end{pmatrix}$.

4. **Exercise 31 from section 2.5** For this problem, use the interactive row reducer to row reduce the matrix A (MATHLAB might use a permuted lower triangular matrix): <http://people.math.gatech.edu/~jrabinoff6/1718F-1553/demos/rrinter.html>