

DelftX: OT.1x Observation theory: Estimating the Unknown

Help

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Graded Assignment due Feb 8, 2017 17:30 IST

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Exercises: Uniqueness of solutions

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Underdetermined matrices

1/1 point (ungraded)

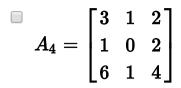
Let the system of equations by given by $y=A_ix$, with i=1,2,3,4. Which of the following A_i results in a underdetermined system?

$$A_1 = egin{bmatrix} 3 & 1 \ 1 & 3 \end{bmatrix}$$

$$A_2=egin{bmatrix}3&6\1&2\1&2\end{bmatrix}$$

$$A_3 = egin{bmatrix} 3 & 1 & 2 \ 1 & 0 & rac{2}{3} \ 6 & 1 & 4 \end{bmatrix}$$

- 4. Best Linear Unbiased Estimation (BLUE)
- Pre-knowledgeMathematics
- MATLAB Learning Content





Explanation

The rank of A_2 is 1, whereas n=2; the second column is simply 2 times the first column.

The rank of A_3 is 2, whereas n=3; the third column is 2/3 times the first column.

In these cases, the columns are not independent.

You may also compute the rank of a matrix with Matlab, using e.g. rank(A2) with A2 the matrix of interest.

Submit

✓ Correct (1/1 point)

Is there a solution?

5/5 points (ungraded)

Assume we have a system of equations y = Ax.

For each A-matrix, select one of the options:

$$A = \begin{bmatrix} 3 & 1 \\ 1 & 3 \end{bmatrix}$$

- system will have one solution
- system may have a solution
- system does not have a solution

Answer

Correct: $\operatorname{rank}(A) = 2 = m = n$

$$A=egin{bmatrix} 3 & 6\ 1 & 2\ 1 & 2 \end{bmatrix}$$

- system will have one solution
- system may have a solution
- system does not have a solution

Answer

Correct: ${
m rank}(A)=1$, and m=3. The rank is smaller than m so there might be a solution.

$$A = egin{bmatrix} 1 & 6 \ 1 & 2 \ 1 & 3 \end{bmatrix}$$

- system will have one solution
- system may have a solution
- system does not have a solution

Answer

Correct:

rank(A) = 2, and m = 3. The rank is smaller than m so there might be a solution. If there is a solution, it will be unique since n = 2 = rank(A).

$$A = \left[egin{array}{cccc} 3 & 1 & 2 \ 1 & 0 & rac{2}{3} \ 6 & 1 & 4 \end{array}
ight]$$

- system will have one solution
- system may have a solution
- system does not have a solution

Answer

Correct:

 ${
m rank}(A)=2$, and m=3, so it may have a solution, which will not be unique, since $n=3>{
m rank}(A)$.

$$A = egin{bmatrix} 3 & 1 & 2 \ 1 & 0 & 2 \ 6 & 1 & 4 \end{bmatrix}$$

- system will have one solution
- system may have a solution
- system does not have a solution

Answer

Correct: $\operatorname{rank}(A) = 3 = m = n$

Submit

✓ Correct (5/5 points)

True or False
2/2 points (ungraded)
Underdetermined systems do not have a solution.
false ✓ Answer: false
Explanation
If an underdetermined system is consistent, it will have an infinite number of solutions.
Underdetermined systems are always inconsistent.
false ✓ Answer: false
Explanation
A system is inconsistent if it does not have a solution.
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✓ Correct (2/2 points)

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