F.3.2 Final Questions 3-4

Bookmark this page

Calculator

Final Exam due Jan 5, 2024 00:12 IST Completed

F.3.2 Final Questions 3-4

Discussion

Topic: Final / F.3.2

Hide Discussion

Add a Post

Show all posts by recent activity

There are no posts in this topic yet.

✖

Question 3

9/9 points (graded)

Compute the inverse of the following matrix: $A = \begin{pmatrix} 1 & 3 & 0 \\ -1 & 0 & 1 \\ 0 & -1 & -1 \end{pmatrix}$.

-1/2 ✔	-3/2 ✔	-3/2 ✔
Answer: -1/2	Answer: -3/2	Answer: -3/2
1/2 ✔	1/2 ✔	1/2 ✔
Answer: 1/2	Answer: 1/2	Answer: 1/2
-1/2 ✔	-1/2 ✔	-3/2 ✔
Answer: -1/2	Answer: -1/2	Answer: -3/2

$$A^{-1} = \begin{pmatrix} -1/2 & -3/2 & -3/2 \\ 1/2 & 1/2 & 1/2 \\ -1/2 & -1/2 & -3/2 \end{pmatrix}$$

Submit

Answers are displayed within the problem

Question 4

34/34 points (graded)

Compute the inverses of the following matrices

1. $A = \begin{pmatrix} 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \end{pmatrix}$.

Calculator

$A^{-1} =$

0	1	0	0
✔ Answer: 0	✔ Answer: 1	✔ Answer: 0	✔ Answer: 0
0	0	0	1
✔ Answer: 0	✔ Answer: 0	✔ Answer: 0	✔ Answer: 1
1	0	0	0
✔ Answer: 1	✔ Answer: 0	✔ Answer: 0	✔ Answer: 0
0	0	1	0
✔ Answer: 0	✔ Answer: 0	✔ Answer: 1	✔ Answer: 0

It helps to remember that if P is a permutation matrix, then $P^{-1} = P^T$. $A^{-1} = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{pmatrix}$

2. $L_0^{-1} = \begin{pmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 2 & 0 & 1 \end{pmatrix}$, $L_1^{-1} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix}$, $U^{-1} = \begin{pmatrix} 2 & -1 & 0 \\ 0 & -1 & -2 \\ 0 & 0 & 1 \end{pmatrix}$, and $A = L_0 L_1 U$. Then $A^{-1} =$

3 ✔	-1 ✔	0 ✔
Answer: 3	Answer: -1	Answer: 0
-1 ✔	-3 ✔	-2 ✔
Answer: -1	Answer: -3	Answer: -2
1 ✔	1 ✔	1 ✔
Answer: 1	Answer: 1	Answer: 1

It helps to remember that

$$A^{-1} = (L_0 L_1 U)^{-1} = U^{-1} L_1^{-1} L_0^{-1}.$$

So,

$$A^{-1} = \underbrace{\begin{pmatrix} 2 & -1 & 0 \\ 0 & -1 & -2 \\ 0 & 0 & 1 \end{pmatrix}}_{U^{-1}} \underbrace{\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix}}_{L_1^{-1}} \underbrace{\begin{pmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 2 & 0 & 1 \end{pmatrix}}_{L_0^{-1}}$$

Next, it helps to think through what happens when you multiply

$$\left(\begin{array}{c|c|c} c_0 & c_1 & c_2 \end{array} \right) \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix} = \left(\begin{array}{c|c|c} c_0 & c_1 + c_2 & c_2 \end{array} \right)$$

and

$$\begin{pmatrix} 1 & 0 & 0 \end{pmatrix}$$

Calculator

$$\left(\begin{array}{c|c|c} c_0 & c_1 & c_2 \end{array} \right) \begin{pmatrix} -1 & 1 & 0 \\ 2 & 0 & 1 \end{pmatrix} = \left(\begin{array}{c|c|c} c_0 - c_1 + 2c_2 & c_1 & c_2 \end{array} \right)$$

Hence

$$A^{-1} = \underbrace{\underbrace{\left(\begin{array}{c|c|c} 2 & -1 & 0 \\ 0 & -1 & -2 \\ 0 & 0 & 1 \end{array} \right) \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix}}_{\left(\begin{array}{c|c|c} 2 & -1+0 & 0 \\ 0 & -1-2 & -2 \\ 0 & 0+1 & 1 \end{array} \right) = \begin{pmatrix} 2 & -1 & 0 \\ 0 & -3 & -2 \\ 0 & 1 & 1 \end{pmatrix}} \begin{pmatrix} 1 & 0 & 0 \\ -1 & 1 & 0 \\ 2 & 0 & 1 \end{pmatrix}}_{\left(\begin{array}{c|c|c} 2-(-1)(-1)+(2)(0) & -1 & 0 \\ 0+(-1)(-3)+(2)(-2) & -3 & -2 \\ 0+(-1)(1)+(2)(1) & 1 & 1 \end{array} \right) = \begin{pmatrix} 3 & -1 & 0 \\ -1 & -3 & -2 \\ 1 & 1 & 1 \end{pmatrix}}$$

3. $D = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 5 & 2 \\ 0 & 2 & 1 \end{pmatrix}$. Then $D^{-1} =$

1 ✔	0 ✔	0 ✔
Answer: 1	Answer: 0	Answer: 0
0 ✔	1 ✔	-2 ✔
Answer: 0	Answer: 1	Answer: -2
0 ✔	-2 ✔	5 ✔
Answer: 0	Answer: -2	Answer: 5

(Hint: How is the inverse of matrix $\begin{pmatrix} 1 & 0 \\ 0 & B \end{pmatrix}$ related to B^{-1}?)

$$\begin{pmatrix} 1 & 0 \\ 0 & B \end{pmatrix}^{-1} = \begin{pmatrix} 1 & 0 \\ 0 & B^{-1} \end{pmatrix}$$

Now,

$$\begin{aligned} B^{-1} &= \begin{pmatrix} 5 & 2 \\ 2 & 1 \end{pmatrix}^{-1} = \frac{1}{(5)(1)-(2)(2)} \begin{pmatrix} 1 & -2 \\ -2 & 5 \end{pmatrix} \\ &= \frac{1}{1} \begin{pmatrix} 1 & -2 \\ -2 & 5 \end{pmatrix} = \begin{pmatrix} 1 & -2 \\ -2 & 5 \end{pmatrix}. \end{aligned}$$

Hence

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 5 & 2 \\ 0 & 2 & 1 \end{pmatrix}^{-1} = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & -2 \\ 0 & -2 & 5 \end{pmatrix}$$

Submit

Answers are displayed within the problem

Calculator

< Previous Next >

edX

About
Affiliates
edX for Business
Open edX
Careers
News

Legal

Terms of Service & Honor Code
Privacy Policy
Accessibility Policy
Trademark Policy
Sitemap
Cookie Policy
Your Privacy Choices

Connect

Idea Hub
Contact Us
Help Center
Security
Media Kit

GET IT ON Google play
Download on the App Store

Calculator