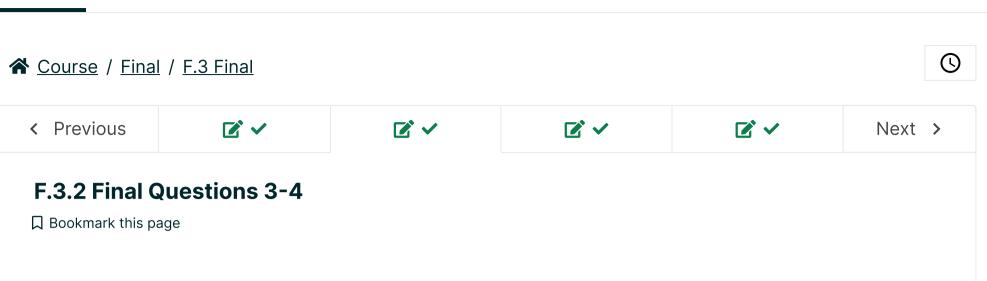


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F.3.2 Final Questions 3-4

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Question 3

9/9 points (graded)

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

-3/2

-3/2

Answer: -3/2

Answer: -1/2

1/2

Answer: -3/2

1/2

1/2

Answer: 1/2

-1/2

Answer: 1/2

-1/2

Answer: 1/2

-3/2

Answer: -3/2

Answer: -1/2

Answer: -1/2

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

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1 Answers are displayed within the problem

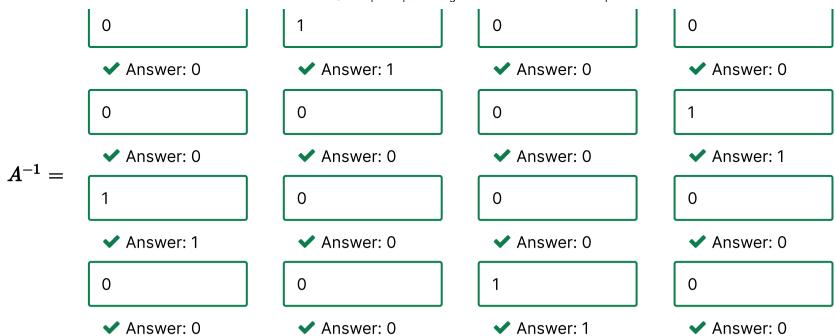
Question 4

34/34 points (graded)

Compute the inverses of the following matrices

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

■ Calculator



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

2.
$$L_0^{-1}=egin{pmatrix}1&0&0\\-1&1&0\\2&0&1\end{pmatrix}$$
 , $L_1^{-1}=egin{pmatrix}1&0&0\\0&1&0\\0&1&1\end{pmatrix}$, $U^{-1}=egin{pmatrix}2&-1&0\\0&-1&-2\\0&0&1\end{pmatrix}$, and $A=L_0L_1U$. Then $A^{-1}=C_0$

It helps to remember that

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

So,

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

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

$$\left(egin{array}{cc|c} c_0 & c_1 & c_2 \end{array}
ight) \left(egin{array}{cc|c} 1 & 0 & 0 \ 0 & 1 & 0 \ 0 & 1 & 1 \end{array}
ight) = \left(egin{array}{cc|c} c_0 & c_1 + c_2 & c_2 \end{array}
ight)$$

and

$$\left(egin{array}{cc|c} c_0 & c_1 & c_2 \end{array}
ight) \left(egin{array}{cc|c} -1 & 1 & 0 \ 2 & 0 & 1 \end{array}
ight) = \left(egin{array}{cc|c} c_0 - c_1 + 2c_2 & c_1 & c_2 \end{array}
ight)$$

Hence

$$A^{-1} = egin{array}{c|cccc} 2 & -1 & 0 \ 0 & -1 & -2 \ 0 & 0 & 1 \end{pmatrix} egin{array}{c|cccc} 1 & 0 & 0 \ 0 & 1 & 0 \ 0 & 1 & 1 \end{pmatrix} & egin{array}{c|cccc} 1 & 0 & 0 \ -1 & 1 & 0 \ 2 & 0 & 1 \end{pmatrix} \ egin{array}{c|ccccc} 2 & -1 & 0 \ 0 & -1 - 2 & -2 \ 0 & 0 + 1 & 1 \end{pmatrix} = egin{array}{c|cccc} 2 & -1 & 0 \ 0 & -3 & -2 \ 0 & 1 & 1 \end{pmatrix} \ egin{array}{c|ccccc} 2 & -1 & 0 \ 0 & -3 & -2 \ 0 & 1 & 1 \end{pmatrix} \ egin{array}{c|ccccc} 2 & -1 & 0 \ 0 & -3 & -2 \ 0 & 1 & 1 \end{pmatrix} = egin{array}{c|ccccc} 3 & -1 & 0 \ -1 & -3 & -2 \ 0 & + (-1) & (1) & + & (2) & (1) & 1 & 1 \end{pmatrix} = egin{array}{c|ccccc} 3 & -1 & 0 \ -1 & -3 & -2 \ 1 & 1 & 1 \end{pmatrix}$$

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

 1
 Image: Control or control or

(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,

$$B^{-1} = egin{pmatrix} 5 & 2 \ 2 & 1 \end{pmatrix}^{-1} = rac{1}{(5)(1) - (2)(2)} inom{1 & -2}{-2 & 5} \ = rac{1}{1} inom{1 & -2}{-2 & 5} = inom{1 & -2}{-2 & 5}.$$

Hence

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

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