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F.3.1 Final Questions 1-2

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

F.3.1 Final Questions 1-2

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Question 1

17/17 points (graded) Compute

$$\begin{pmatrix} -3 \\ 0 \\ 4 \end{pmatrix}^T \begin{pmatrix} -3 \\ 0 \\ 4 \end{pmatrix} = 25$$
 Answer: 25

1

$$\begin{pmatrix} -3 \\ 0 \\ 4 \end{pmatrix}$$

$$\begin{pmatrix} -3 \\ 0 \\ 4 \end{pmatrix} = (-3 \quad 0 \quad 4) \begin{pmatrix} -3 \\ 0 \\ 4 \end{pmatrix}$$

$$= (-3)(-3) + (0)(0) + (4)(4)$$

$$= 9 + 16$$

$$= 25$$

$$\left\| \begin{pmatrix} -3 \\ 0 \\ 4 \end{pmatrix} \right\|_2 = \boxed{5}$$
 Answer: 5

Recall that $\|\cdot\|_2$ equals the 2-norm, which is another way of denoting the length of a vector.

$$\sqrt{\left(-3\right)^2+0^2+\left(4\right)^2}=\sqrt{9+16}=\sqrt{25}=5.$$

Or you can recognize that

and use the result from the last part of this question.

$$\begin{pmatrix} 0 \\ 1 \\ 2 \\ 3 \end{pmatrix} \begin{pmatrix} -1 \\ 0 \\ 2 \end{pmatrix}^{T} = \begin{pmatrix} 0 \\ -1 \\ -2 \\ Answer: -1 \\ -2 \\ Answer: -2 \\ Answer: 0 \\ An$$

3.

$$egin{pmatrix} 0 \ 1 \ 2 \ 3 \end{pmatrix} (-1 & 0 & 2) = egin{pmatrix} 0 & 0 & 0 \ -1 & 0 & 2 \ -2 & 0 & 4 \ -3 & 0 & 6 \end{pmatrix}$$

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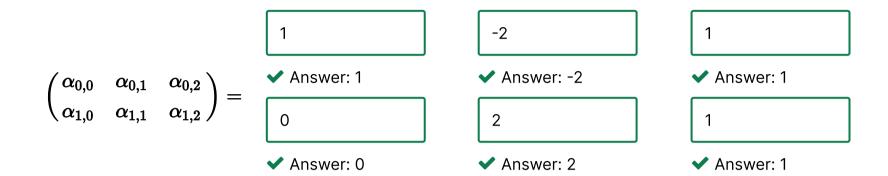
Question 2

10.0/10.0 points (graded) Consider

$$\left(egin{array}{ccc} 1 & -z & 1 \ -1 & 4 & 0 \end{array}
ight)\left(egin{array}{c} \chi_1 \ \chi_2 \end{array}
ight) = \left(egin{array}{c} -z \ 5 \end{array}
ight).$$

ullet Write the system of linear equations Ax=b and reduce it to row echolon form, yielding

$$\left(egin{array}{c|ccc} lpha_{0,0} & lpha_{0,1} & lpha_{0,2} & eta_0 \ lpha_{1,0} & lpha_{1,1} & lpha_{1,2} & eta_1 \end{array}
ight)$$



 $\begin{pmatrix} \beta_0 \\ \beta_1 \end{pmatrix} = \begin{bmatrix} -2 \\ 3 \end{bmatrix}$ Answer: -2

$$\left(egin{array}{c|cc|c} 1 & -2 & 1 & -2 \ 0 & 2 & 1 & 3 \end{array}
ight)$$

- For each variable, identify whether it is a free variable or dependent variable:
 - χ_0 :

Dependent

Answer: Dependent

• χ₁:

Dependent

Answer: Dependent

χ₂:

Free

Answer: Free

- Which of the following is a specific (particular) solution: (Mark all correct answers)
 - $\begin{array}{c} \bullet & \begin{pmatrix} 1 \\ 1/2 \\ 0 \end{pmatrix} \end{array}$

FALSE

✓ Answer: FALSE

 $\cdot \begin{pmatrix} -1 \\ 1 \\ 1 \end{pmatrix}$

TRUE ✓ ✓ Answer: TRUE

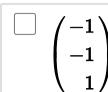
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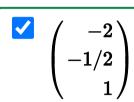
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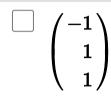
FALSE

✓ Answer: FALSE

• Which of the following is a vector in the null space: (Mark all correct answers)









• Which of the following expressed a general (total) solution: (Mark all correct answers)

$$egin{pmatrix} -1 \ 1/2 \ 0 \end{pmatrix} + \gamma egin{pmatrix} -1 \ -1 \ 1 \end{pmatrix}$$

$$egin{pmatrix} igcup_{1/2} -1 \ 1/2 \ 0 \end{pmatrix} + \gamma egin{pmatrix} -2 \ -1/2 \ 1 \end{pmatrix}$$

$$egin{pmatrix} igwedge 1 \ 3/2 \ 0 \ \end{pmatrix} + \gamma egin{pmatrix} -2 \ -1/2 \ 1 \ \end{pmatrix}$$



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1 Answers are displayed within the problem

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