me me **ft-uiowa-math2550**
Assignment HW5fall14 due 09/25/2014 at 11:59pm CDT

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1. **(1 pt) Library/TCNJ/TCNJ_SolutionSetsLinearSystems-/problem8.pg**

Suppose the solution set of a certain system of equations can be described as $x_1 = 4-6t$, $x_2 = 4+6t$, $x_3 = 4t-3$, $x_4 = -6-4t$, where t is a free variable. Use vectors to describe this solution set as a line in $\mathbb{R}^4$.

$$L(t) = \left[\begin{array}{c} \text{—} \\ \text{—} \\ \text{—} \\ \text{—} \end{array}\right] + t \left[\begin{array}{c} \text{—} \\ \text{—} \\ \text{—} \\ \text{—} \end{array}\right].$$

Correct Answers:

- $\left[\begin{array}{c} 4 \\ 4 \\ -3 \\ -6 \end{array}\right]$, $\left[\begin{array}{c} -6 \\ 6 \\ 4 \\ -4 \end{array}\right]$

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2. **(1 pt) Library/NAU/setLinearAlgebra/HomLinEq.pg**

Solve the equation

$$-2x-4y-5z = 0$$

$$\left[\begin{array}{c} x \\ y \\ z \end{array}\right] = s \left[\begin{array}{c} \text{—} \\ \text{—} \\ \text{—} \end{array}\right] + t \left[\begin{array}{c} \text{—} \\ \text{—} \\ \text{—} \end{array}\right]$$

Correct Answers:

- ```
  \(\displaystyle\left.\begin{array}{c}
  \mbox{-4} \cr
  \mbox{2} \cr
  \mbox{0} \cr
  \end{array}\right.\) ,\(\displaystyle\left.\begin{array}{c}
  \mbox{-5} \cr
  \mbox{0} \cr
  \mbox{2} \cr
  \end{array}\right.\)
  ```

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3. **(1 pt) local/Library/UI/LinearSystems/ur_la_1_19AxB.pg**

Solve the system

$$\left\{\begin{array}{l} 4x_1-5x_2+2x_3+3x_4 = 0 \\ -x_1 + x_2+3x_3+2x_4 = 0 \\ 3x_1-4x_2+5x_3+5x_4 = 0 \\ 3x_1-3x_2-9x_3-6x_4 = 0 \end{array}\right.$$

$$\left[\begin{array}{c} x_1 \\ x_2 \\ x_3 \\ x_4 \end{array}\right] = + \left[\begin{array}{c} \text{—} \\ \text{—} \\ \text{—} \\ \text{—} \end{array}\right] s + \left[\begin{array}{c} \text{—} \\ \text{—} \\ \text{—} \\ \text{—} \end{array}\right] t.$$

Solve the system

$$\left\{\begin{array}{l} 4x_1-5x_2+2x_3+3x_4 = 3 \\ -x_1 + x_2+3x_3+2x_4 = 4 \\ 3x_1-4x_2+5x_3+5x_4 = 7 \\ 3x_1-3x_2-9x_3-6x_4 = -12 \end{array}\right.$$

$$\left[\begin{array}{c} x_1 \\ x_2 \\ x_3 \\ x_4 \end{array}\right] = \left[\begin{array}{c} \text{—} \\ \text{—} \\ \text{—} \\ \text{—} \end{array}\right] + \left[\begin{array}{c} \text{—} \\ \text{—} \\ \text{—} \\ \text{—} \end{array}\right] s + \left[\begin{array}{c} \text{—} \\ \text{—} \\ \text{—} \\ \text{—} \end{array}\right] t.$$

If the matrix A corresponds to the coefficient matrix for the above system of equations, then given any vector $\vec{b}$, the matrix equation $A\vec{x} = \vec{b}$ will always has an infinite number of solutions.

- A. True
- B. False

Correct Answers:

- ```
  \(\displaystyle\left.\begin{array}{c}
  \mbox{17} \cr
  \mbox{14} \cr
  \mbox{1} \cr
  \mbox{0} \cr
  \end{array}\right.\) ,\(\displaystyle\left.\begin{array}{c
  \mbox{13} \cr
  \mbox{11} \cr
  \mbox{0} \cr
  \mbox{1} \cr
  \end{array}\right.\)
  ```
- ```
  \(\displaystyle\left.\begin{array}{c}
  \mbox{-23} \cr
  \mbox{-19} \cr
  \mbox{0} \cr
  \mbox{0} \cr
  \end{array}\right.\) ,\(\displaystyle\left.\begin{array}{c
  \mbox{17} \cr
  \mbox{14} \cr
  \mbox{1} \cr
  ```
  ```

```
\mbox{0} \cr
\end{array}\right.\) ,\(\displaystyle\left.\begin{array}{c}
\mbox{13} \cr
\mbox{11} \cr
\mbox{0} \cr
\mbox{1} \cr
\end{array}\right.\)
```

- B

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4. **(1 pt) local/Library/UI/LinearSystems/ur_la_1_20vv3.pg**

Solve the system

$$\left\{\begin{array}{rrrrrrl} x_1 & -5x_2 & -2x_3 & & -2x_5 & +5x_6 & =0 \\ & & & -x_4 & -2x_5 & -4x_6 & =0 \\ x_1 & -5x_2 & & & +4x_5 & +7x_6 & =0 \end{array}\right.$$

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \end{bmatrix} = \begin{bmatrix} \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \end{bmatrix} s + \begin{bmatrix} \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \end{bmatrix} t + \begin{bmatrix} \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \end{bmatrix} u.$$

Solve the system

$$\left\{\begin{array}{rrrrrrl} x_1 & -5x_2 & -2x_3 & & -2x_5 & +5x_6 & = \ \ 2 \\ & & & -x_4 & -2x_5 & -4x_6 & =-7 \\ x_1 & -5x_2 & & & +4x_5 & +7x_6 & = \ \ 0 \end{array}\right.$$

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \end{bmatrix} = \begin{bmatrix} \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \end{bmatrix} + \begin{bmatrix} \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \end{bmatrix} s + \begin{bmatrix} \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \end{bmatrix} t + \begin{bmatrix} \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \\ \underline{\quad} \end{bmatrix} u.$$

If the matrix A corresponds to the coefficient matrix for the above system of equations, then given any vector $\vec{b}$, the matrix equation $A\vec{x} = \vec{b}$ will always has an infinite number of solutions.

- A. True
- B. False

Correct Answers:

- ```
  \(\displaystyle\left.\begin{array}{c}
  \mbox{5} \cr
  \mbox{1} \cr
  \mbox{0} \cr
  \mbox{0} \cr
  \mbox{0} \cr
  \mbox{0} \cr
  \end{array}\right.\) ,\(\displaystyle\left.\begin{array}{c
  \mbox{-4} \cr
  \mbox{0} \cr
  \mbox{-3} \cr
  \mbox{-2} \cr
  \mbox{1} \cr
  \mbox{0} \cr
  \end{array}\right.\) ,\(\displaystyle\left.\begin{array}{c
  \mbox{-7} \cr
  \mbox{0} \cr
  \mbox{-1} \cr
  \mbox{-4} \cr
  \mbox{0} \cr
  \mbox{1} \cr
  \end{array}\right.\)
  ```
- ```
  \(\displaystyle\left.\begin{array}{c}
  \mbox{0} \cr
  \mbox{0} \cr
  \mbox{-1} \cr
  \mbox{7} \cr
  \mbox{0} \cr
  \mbox{0} \cr
  \end{array}\right.\) ,\(\displaystyle\left.\begin{array}{c
  \mbox{5} \cr
  \mbox{1} \cr
  \mbox{0} \cr
  \mbox{0} \cr
  \mbox{0} \cr
  \mbox{0} \cr
  \end{array}\right.\) ,\(\displaystyle\left.\begin{array}{c
  \mbox{-4} \cr
  \mbox{0} \cr
  \mbox{-3} \cr
  \mbox{-2} \cr
  \mbox{1} \cr
  \mbox{0} \cr
  \end{array}\right.\) ,\(\displaystyle\left.\begin{array}{c
  \mbox{-7} \cr
  \mbox{0} \cr
  \mbox{-1} \cr
  \mbox{-4} \cr
  \mbox{0} \cr
  \mbox{1} \cr
  \end{array}\right.\)
  ```
- A

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5. **(1 pt) UI/Fall14/lin_span.pg**

Let $A = \begin{bmatrix} -15 \\ -2 \\ 33 \end{bmatrix}$, $B = \begin{bmatrix} 3 \\ 2 \\ -5 \end{bmatrix}$, and $C = \begin{bmatrix} 6 \\ 2 \\ -12 \end{bmatrix}$.

Which of the following best describes the span of the above 3 vectors?

- A. 0-dimensional point in R^3
- B. 1-dimensional line in R^3
- C. 2-dimensional plane in R^3
- D. R^3

Determine whether or not the three vectors listed above are linearly independent or linearly dependent.

- A. linearly dependent
- B. linearly independent

If they are linearly dependent, determine a non-trivial linear relation. Otherwise, if the vectors are linearly independent, enter 0's for the coefficients, since that relationship **always** holds.
$\_\_\_A + \_\_\_B + \_\_\_C = 0$.

Correct Answers:

- C
- A
- -1; 3; -4

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6. **(1 pt) UI/Fall14/lin_span2.pg**

Which of the following sets of vectors span R^3?

- A. $\begin{bmatrix} -7 \\ -4 \\ -8 \end{bmatrix}, \begin{bmatrix} 6 \\ 1 \\ 2 \end{bmatrix}, \begin{bmatrix} -9 \\ 0 \\ -3 \end{bmatrix}$
- B. $\begin{bmatrix} 3 \\ 1 \\ 6 \end{bmatrix}, \begin{bmatrix} -1 \\ -9 \\ 5 \end{bmatrix}$
- C. $\begin{bmatrix} 8 \\ -7 \end{bmatrix}, \begin{bmatrix} -4 \\ -2 \end{bmatrix}, \begin{bmatrix} 5 \\ 6 \end{bmatrix}$
- D. $\begin{bmatrix} 7 \\ 2 \\ 0 \end{bmatrix}, \begin{bmatrix} -8 \\ 9 \\ 0 \end{bmatrix}, \begin{bmatrix} -3 \\ -6 \\ 0 \end{bmatrix}$
- E. $\begin{bmatrix} -5 \\ -6 \end{bmatrix}, \begin{bmatrix} -5 \\ -6 \end{bmatrix}$
- F. $\begin{bmatrix} 4 \\ -5 \\ 8 \end{bmatrix}, \begin{bmatrix} -7 \\ -4 \\ -2 \end{bmatrix}, \begin{bmatrix} 11 \\ -1 \\ 10 \end{bmatrix}$

Which of the following sets of vectors are linearly independent?

- A. $\begin{bmatrix} -7 \\ -4 \\ -8 \end{bmatrix}, \begin{bmatrix} 6 \\ 1 \\ 2 \end{bmatrix}, \begin{bmatrix} -9 \\ 0 \\ -3 \end{bmatrix}$
- B. $\begin{bmatrix} 3 \\ 1 \\ 6 \end{bmatrix}, \begin{bmatrix} -1 \\ -9 \\ 5 \end{bmatrix}$
- C. $\begin{bmatrix} 8 \\ -7 \end{bmatrix}, \begin{bmatrix} -4 \\ -2 \end{bmatrix}, \begin{bmatrix} 5 \\ 6 \end{bmatrix}$
- D. $\begin{bmatrix} 7 \\ 2 \\ 0 \end{bmatrix}, \begin{bmatrix} -8 \\ 9 \\ 0 \end{bmatrix}, \begin{bmatrix} -3 \\ -6 \\ 0 \end{bmatrix}$
- E. $\begin{bmatrix} -5 \\ -6 \end{bmatrix}, \begin{bmatrix} -5 \\ -6 \end{bmatrix}$
- F. $\begin{bmatrix} 4 \\ -5 \\ 8 \end{bmatrix}, \begin{bmatrix} -7 \\ -4 \\ -2 \end{bmatrix}, \begin{bmatrix} 11 \\ -1 \\ 10 \end{bmatrix}$

Correct Answers:

- A
- AB