Quiz 1 (5 points total) Math 220, Matrices, Spring 2015

Name:

Problem 1. What are the three elementary row operations?

Problem 2. Is the following statement true?:
Elementary row operations on an augmented matrix do not change its solution set.

Quiz 2 (5 points total) Math 220, Matrices, Spring 2015

Name:

Problem 1 (3 points) Compute the reduced row echelon form of the following matrix: $\begin{pmatrix} 2 & 3 & 0 \\ -6 & 9 & 0 \\ 1 & 0 & 0 \end{pmatrix}$. Write down all intermediate steps.

Problem 2 (2 points) How are the reduced row echelon form of an augmented matrix and solving the corresponding system of linear equations related?

Quiz 3 (5 points total) Math 220, Matrices, Spring 2015

Name:

Problem 1 (2 points) Show that $\begin{pmatrix} 2 \\ 3 \\ 1 \end{pmatrix}$ is a linear combination of $\begin{pmatrix} 2 \\ 0 \\ 1 \end{pmatrix}$, $\begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix}$, and $\begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$.

Problem 2 (i)(2 points) What is the span of $\begin{pmatrix} 2 \\ 0 \\ 1 \end{pmatrix}$, $\begin{pmatrix} 0 \\ 1 \\ 1 \end{pmatrix}$, and $\begin{pmatrix} 0 \\ 0 \\ 1 \end{pmatrix}$ (pick from: empty, line, plane, $\mathbb{R}^3$, or $\mathbb{R}^4$)?

(ii)(1 point) Explain your answer in (i).

Name:

Problem 1 (2 points) Let $A = \begin{pmatrix} 2 & 1 & 0 \\ 0 & 1 & 0 \\ 3 & 0 & 1 \end{pmatrix}$. Do the homogeneous equation $A\mathbf{v} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$ and non-homegeneous equation $A\mathbf{v} = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$ have a common solution? In other words, is there a vector $\mathbf{v}$ in $\mathbb{R}^3$ such that two equations $A\mathbf{v} = \begin{pmatrix} 0 \\ 0 \\ 0 \end{pmatrix}$ and $A\mathbf{v} = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}$ hold simultaneously?

Problem 2 (3 points) (i) Determine whether the set $\left\{ \begin{pmatrix} 1 \\ 0 \\ -2 \end{pmatrix}, \begin{pmatrix} -3 \\ 0 \\ 6 \end{pmatrix} \right\}$ is linearly dependent or not. (ii) What about $\left\{ \begin{pmatrix} 1 \\ 0 \\ -2 \end{pmatrix}, \begin{pmatrix} -3 \\ 0 \\ 6 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \\ 0 \end{pmatrix} \right\}$?

Quiz 5 (5 points total) Math 220, Matrices, Spring 2015

Name:

Problem 1 (2 points) Let $A = \left(\begin{smallmatrix} 2 & -1 \\ 0 & 0 \end{smallmatrix}\right)$, and let T be the linear transformation from $\mathbb{R}^2$ to $\mathbb{R}^2$. (i) What is the range of T? (ii) Does the range of T coincide with its codomain?

Problem 2 (3 points) A, B, and C are $n \times n$ matrices. Pick three from the following five statements, and state whether they are true or false (you don't need to explain).

1. If $AB = AC$, then it is always the case that $B = C$.

2. If $A^2 = 0$, then it is always the case that $A = 0$.

3. Regardless of the entries of A and B, $AB = BA$ always holds.

4. Regardless of the entries A, B, and C, $A(B + C) = AB + AC$ always holds.

5. Regardless of the entries of A, $(A^2)^T = (A^T)^2$ always holds.

Quiz 6 (5 points total) Math 220, Matrices, Spring 2015

Name:

Problem 1 (2 points) Let $T : \mathbb{R}^2 \to \mathbb{R}^2$ be the reflection through the line $y = x$. (For example, we have $T(\left(\begin{smallmatrix}1\\0\end{smallmatrix}\right)) = \left(\begin{smallmatrix}0\\1\end{smallmatrix}\right)$, and $T(\left(\begin{smallmatrix}2\\1\end{smallmatrix}\right)) = \left(\begin{smallmatrix}1\\2\end{smallmatrix}\right)$.) Find the *standard* matrix for this linear transformation.

Problem 2 (3 points) Let $A = \left(\begin{smallmatrix}1 & 2\\-3 & -6\end{smallmatrix}\right)$. (i) Is A invertible? (ii) How many solutions does $A\mathbf{v} = \mathbf{0}$ have? Explain your anwser without solving the equation explicitly.