Name:

Linear Algebra: Quiz 7

<u>Show ALL work, as unjustified answers may receive no credit.</u> Calculators are not allowed on any quiz or test paper. Make sure to exhibit skills discussed in class. Box all answers and clean up answers as much as possible.

1. ***<u>Vector Spaces & Subspaces (4.1)</u>***

[2pts] Find all values of h such that $\vec{y}$ will be in the subspace spanned by $\overrightarrow{v_1}$, $\overrightarrow{v_2}$, $\overrightarrow{v_3}$ if:

$$\overrightarrow{v_1} = \begin{bmatrix} 1 \\ 2 \\ -4 \end{bmatrix}, \quad \overrightarrow{v_2} = \begin{bmatrix} 3 \\ 4 \\ -8 \end{bmatrix}, \quad \overrightarrow{v_1} = \begin{bmatrix} -1 \\ 0 \\ 0 \end{bmatrix}, \quad \vec{y} = \begin{bmatrix} 4 \\ 2 \\ h \end{bmatrix}$$

2. ***<u>Null Space, Column Space, & Linear Transformations (4.2) & Basis (4.3)</u>***

Define a Linear Transformation $T: \mathbb{R}^4 \to \mathbb{R}^3$ by $T\left(\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix}\right) = \begin{bmatrix} x_1 + x_2 \\ x_2 - x_3 \\ x_1 + x_4 \end{bmatrix}$.

(a) [2pts] Find the Null Space of T

(b) [2pts] Find the Column Space of T

(c) [2pts] Find the Basis for the Null Space of T

(d) [2pts] Find the Basis for the Column Space of T

$*\ The\ Column\ Space\ of\ T\ is\ Col(A)\ \&\ the\ Null\ Space\ of\ T\ is\ the\ Nul(A), where\ A\ is\ the\ Standard\ Matrix\ of\ T\ *$

Name:

Linear Algebra: Quiz 8

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1. ***Coordinate Systems (4.4)***

[4pts] Use the coordinate vectors to determine whether the given polynomials are Linearly Dependent in $\mathbb{P}_2$. Let $\mathcal{B}$ be the Standard Basis of the space $\mathbb{P}_2$ of polynomials, that is $\mathcal{B} = \{ 1, t, t^2 \}$:

$$1 + 2t \ , \qquad 3 + 6t^2 \ , \qquad 1 + 3t + 4t^2$$

2. ***The Dimensions of a Vector (4.5)***

Consider the matrix:

$$A = \begin{bmatrix} 1 & -2 & 3 & 1 & 0 & 5 & -4 \\ 0 & 0 & 1 & -6 & 2 & -2 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 3 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

(a) [3pts] Find the Basis and Dimension of the Column Space of A.

(b) [3pts] Find the Basis and Dimension of the Null Space of A.

Name:

Linear Algebra: Quiz 9

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1. ***<u>Change of Basis (4.7)</u>***

Let $\mathcal{B} = \left\{ \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \right\}$ and $\mathcal{C} = \left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} \right\}$ be two Bases for $\mathbb{R}^3$.

(a) [3pts] Find the Change of Coordinates Matrix from $\mathcal{B}$ to $\mathcal{C}$.

(b) [3pts] Find the Change of Coordinates Matrix from $\mathcal{C}$ to $\mathcal{B}$.

(c) [4pts] Let $\vec{x}$ be a vector in $\mathbb{R}^3$, such that $[\ \vec{x}\ ]_{\mathcal{B}} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$. Find $\vec{x}$ and $[\ \vec{x}\ ]_{\mathcal{C}}$