2019 Fall EECS205002 Linear Algebra

Name: ID:

2019/11/20 Quiz 5

1. (2 points) In homework assignment 2, you need to transform a 3D coordinate (x, y, z) to a 2D coordinate $(x/z, y/z)$ for $z \neq 0$. Is this a linear transformation mapping $\mathbb{R}^3$ into $\mathbb{R}^2$? Justify your answer.

2. (3 points) For a matrix $A = \begin{bmatrix} -3 & 1 & 4 & 3 \\ 1 & 2 & -2 & -1 \\ -3 & 8 & 2 & 4 \end{bmatrix}$,

    (a) find a basis for A's row space using A's row vectors.

    (b) find a basis for A's column space using A's column vectors.

    (c) find a basis for A's null space.

3. (5 points) Let $L(\vec{x}) = (x_2, x_1, x_1 + x_2)^T$ for $\vec{x} = (x_1, x_2)^T$.

   (a) What is the kernel of $L(\vec{x})$?

   (b) What is the range of $L(\vec{x})$?

   (c) Does $L(\vec{x})$ map $\mathbb{R}^2$ "onto" $\mathbb{R}^3$? Justify your answer.

   (d) Is $L(\vec{x})$ a "one-to-one" mapping? Justify your answer.

   (e) What is the matrix representation of $L(\vec{x})$ from $\mathbb{R}^2$ to $\mathbb{R}^3$?