

Name: _____

PS #7 – Section 6.1 – 6.3

Spring 2021

Due 4/26/2021

Write your solutions on this document or on your own paper. Your work is not necessary. However, note I cannot give partial credit for completely incorrect answers. The more reasoning/work you show, the better the chance for partial credit if you get something wrong.

1. For the following linear transformation, T ,

$$w_1 = 3x_1 - 6x_2 + 2x_3$$

$$w_2 = -2x_1 + 4x_2 + x_3$$

$$w_3 = x_1 - 2x_2 - x_3$$

$$w_4 = -x_1 + 2x_2 + 2x_3$$

- i) Find the matrix that represents this transformation.
- ii) Determine the domain of T . _____
- iii) Determine the codomain of T . _____
- iv) Find a basis for $\ker(T)$.
- v) Determine the dimension of the $\ker(T)$. _____
- vi) Find a basis for $\text{range}(T)$.
- vii) Determine the dimension of the $\text{range}(T)$. _____
- viii) Is T a one-to-one mapping? Explain your reasoning.
- ix) Is T an onto mapping? Explain your reasoning.
- x) Determine whether the linear transformation defined by the equations is invertible; if so, find the standard matrix for the inverse transformation, and find T^{-1} . If it is not invertible, explain why.

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2. Let T be the transformation $T(x, y, z) = (x - 2z, 2y + x, x + 3z)$

- xi) Determine the domain of T . _____
- xii) Determine the codomain of T . _____
- xiii) Find a basis for the range of T .

- xiv) Is T onto? Explain your reasoning.

- xv) Find a basis for the kernel of T .

- xvi) Is T one-to-one? Explain your reasoning.

- xvii) Is T an isomorphism? Explain your reasoning. If it is, write the inverse transformation. (Don't just give the inverse matrix! I want the inverse TRANSFORMATION!)

- xviii) Prove that T is a linear transformation. (Do this on a separate piece of paper.)