

1. You are allowed to use your lecture notes and textbook.
2. Google search is not allowed.
3. Please check your answers and make sure you don't make any arithmetic mistakes.
4. When you finish the exam, submit it to Canvas by April 16, 11:59pm. I do not accept any other method of submission.
5. Make sure that your solutions are all in one pdf. You can take photos but make one file, do not post photos of each page individually.

Good luck!

1. Let $M = \{(u_1, u_2, u_3) \in \mathbb{R}^3 : u_1 + u_2 = 2\}$. Is M a subspace of \mathbb{R}^3 ? Explain your answer, if your answer is yes, give a proof why it is a subspace. If your answer is no, then show why it is not a subspace.

2. Let $S = \{(a, b, c, d) \in \mathbb{R}^4 : a + b + c = 0\}$.

(a) Show that S is a subspace of \mathbb{R}^4 .

(b) Find a basis for S .

3. Consider the following functions $T : \mathbb{R}^3 \rightarrow \mathbb{R}^2$. Explain in each case, why T is not a linear transformation.

(a) $T((x, y, z)) = (x + 2y + 3z + 1, 2y - 3x + z)$.

(b) $T((x, y, z)) = (x + 2y^2 + 3z, 2y + 3x + z)$.

4. Let T be the linear transformation from \mathbb{R}^2 to \mathbb{R}^2 defined by reflection across the line $y = -x$. Find the standard matrix for T . Do not use any formulas other than the ones we learned in class/zoom lectures. (You can use vector projection formulas.) Write your solution carefully.