MA1011: Problem Sheet 8 (Linear Maps)

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Date of Submission

16 January 2023 by 1200 IST. If I am not in the office (F-7) then please slide your submission under the door. Make sure to staple any loose sheets of paper.

General Rules

- This problem sheet will be graded, the numbers in the brackets denote the points for each question.
- You can work in groups and you are free to consult any material that you wish to, but please mention them when you write down your answers/solutions. You must also mention your roll number, section and branch at the top of your submission.

Problems

1. Show that every linear map $T : \mathbb{R} \to \mathbb{R}$ has the form $T(x) = ax$ for some constant a and $x \in \mathbb{R}$. [**2 points**]
2. Is the definition of the length of a vector $v \in \mathbb{R}^n$ a linear map? Justify your answer. [**2 points**]
3. What might be the 'inverse' of a linear map $T : V \to W$? Explain with at least two examples. [**2+2 points**]
4. Is $\mathbb{R}^2$ a subspace of the complex vector space $\mathbb{C}^2$? Justify your answer. [**2 points**]
5. Give an example of a non-trivial vector space over $\mathbb{Q}$ which was not mentioned in the lecture. [**2 points**]