MA 2203: MATHEMATICS IV

Spring 2019: Mid-semester exam

Maximum marks: 20   February 23, 2019   Duration: 1 hour

1. **Answer the following questions**

   (i) Define distance preserving map in $\mathbb{R}^2$. Give an example.

   (ii) Let S be the triangle in $\mathbb{R}^2$ joining the points $(0,0), (1,0)$ and $(1,1)$. Find an explicit map $f : \mathbb{R}^2 \to \mathbb{R}^2$, which is a nonidentity isometry, such that $f(S) = S$

   $(3 + 7 = 10 \ marks)$

2. **(True or False: Justify your answer)**

   Any inner product preserving map $f : \mathbb{R}^2 \to \mathbb{R}^2$ is an isometry of $\mathbb{R}^2$

   $(10 \ marks)$

The distance in $\mathbb{R}^2$ should be considered as the standard distance

$$d((x_1, y_1), ((x_2, y_2)) := \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}.$$

The inner product in $\mathbb{R}^2$ is the standard inner product $\langle (x_1, y_1), (x_2, y_2) \rangle = x_1 x_2 + y_1 y_2$. A map $f : \mathbb{R}^2 \to \mathbb{R}^2$ is said to be inner product preserving map if $\langle f(x), f(y) \rangle = \langle x, y \rangle$ for all $x, y \in \mathbb{R}^2$.