Professor Arguz **B3.2 Geometry of Surfaces** **MT 2025**

Problem Sheet 1

Part A.

1. Show that the following topological spaces are homeomorphic.

a) The interval $[0, 1]$ and the interval $[2, 5]$.

b) The interval $(-1, 1)$ and the real line.

2. Show that there is a quotient map $q : (-2, 2) \to [-1, 1]$, but not a quotient map $p : [-2, 2] \to (-1, 1)$.

3. Let S^2 denote the sphere, and let X be a compact, connected surface. Show that the connected sum $S\#X$ is homeomorphic to X.

For the Part B questions (the ones that will be marked), please refer to Sheet1-PartB, which has been uploaded separately as an assignment, under the Course Material.

Part C.

1. Show that the closed disc of radius 1 in $\mathbb{R}^2$ and the closed square in $\mathbb{R}^2$ are homeomorphic.