

Math 364 Problem Sheet 2: Due Sept. 25

1. Show that every finite set of points in \mathbb{R}^n is closed.
2. Label each of the following sets as open, closed or neither:
 - (a) The set of all points x in \mathbb{R} such that $0 < x^2 \leq 1$.
 - (b) The parabola $y = x^2$ in \mathbb{R}^2
 - (c) The set of points in \mathbb{R}^2 whose distance to some point of the parabola $y = x^2$ is less than 0.1.
3. True or False: “If A and $A \cup B$ are open then so is B ”?
4. Consider the real line \mathbb{R} as the horizontal axis (x-axis) in the plane \mathbb{R}^2 . In this way we can consider every subset of \mathbb{R}^1 as also being a subset of \mathbb{R}^2 . Suppose that $A \subset \mathbb{R}^1$ is closed in \mathbb{R}^1 . Prove that it is also closed as a subset in \mathbb{R}^2 .
5. Show that if $h: X \rightarrow Y$ is a homeomorphism, then it takes open sets in X to open sets in Y .
6. Prove that the set of points in the interval $[0, 1/2] \subset \mathbb{R}^1$ is uncountable.