

- 1 Define a subset of  $\mathbb{R}^2$  as  
5 points

$$S = \{(x, y) : y = \sin(1/x), x > 0\}$$

Is  $S$  a closed set on  $\mathbb{R}^2$ ? Explain your answer.

- 2 Let  $X$  and  $Y$  be two nonempty connected subsets of  $\mathbb{R}^n$  such that  $X \cap Y \neq \emptyset$ .  
5 points Prove that  $Z = X \cup Y$  is also a connected subset of  $\mathbb{R}^n$ .