

- ① Prove that the product of a positive number with a negative number is negative; and the product of two negative numbers is positive.

Once you solve and turn in your solution to ①, you will be allowed to use the standard rules to manipulate inequalities, without giving detailed justification. (But make sure you use the correct rules!)

- ② Is the function $f: \mathbb{R} \rightarrow \mathbb{R}$ given by $f(x) = \frac{2x}{x^2+1}$ injective? (If answer is yes, prove it. If answer is no, prove it.)

- ③ Is the set $S = \{x \in \mathbb{R} : 2x+5 > 0\}$ bounded above? bounded below?

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① $\sup \{x \in \mathbb{R} : 2x+5 > 0\} = ?$
 $\inf \{x \in \mathbb{R} : 2x+5 > 0\} = ?$

- ② If $E \subset \mathbb{R}$ is bounded, $E \neq \emptyset$, prove $\sup E \geq \inf E$.
- ③ Prove $\inf \{ \frac{1}{n} : n \in \mathbb{N} \} = 0$. In your proof use only the axioms we postulated in class and what we deduced from them as Theorems, Propositions, etc.