MATH 5301 Elementary Analysis - Homework 2

Jonas Wagner

2021, September 08

Problem 1

For a function $f : A \to B$, show the follwoing for any $X \subset A, Y, Z \supset B$

a) $X \subset f^{-1}(f(X))$

b) $f(f^{-1}(Y)) \supset Y$

c) $f^{-1}(Y \cup Z) = f^{-1}(Y) \cup f^{-1}(Z)$

d) $f^{-1}(Y \cap Z) = f^{-1}(Y) \cap f^{-1}(Z)$

Problem 2

Show that:

a) $A \cap \bigcup_{\lambda \in \Lambda} A_\lambda = \bigcup_{\lambda \in \Lambda} (A_\lambda \cap A)$

b) $\left(\bigcap_{\lambda \in \Lambda} A_\lambda \right) \cup \left(\bigcap_{\lambda \in \Lambda} B_\lambda \right) = \bigcap_{\lambda \in \Lambda} (A_\lambda \cup B_\lambda)$

Problem 3

Which of these are equivalence relations?

a)

for $a, b \in$, let $a \mathcal{R} b$ if $a - b \in$