

Name:
Student ID:

CSED261: Discrete Mathematics for Computer Science

Homework 3: Sets and Set Operations & Function and Sequences & Set Cardinality and Matrices

Question 1. Prove or disprove that if A, B and C are nonempty sets and $A \times B = A \times C$, then $B = C$.

Solutions

Question 2. Let A, B , and C be sets. Use the identity $A - B = A \cap \overline{B}$, which holds for any sets A and B , and the set identities to show that $(A - B) \cap (B - C) \cap (A - C) = \emptyset$.

Solutions

Question 3. Show that if x is a real number, then $[x] - [x] = 1$ if x is not an integer and $[x] - [x] = 0$ if x is an integer.

Solutions

Question 4. Use the identity $1/(k(k+1)) = 1/k - 1/(k+1)$ and **telescoping** to compute $\sum_{k=1}^n 1/(k(k+1))$.

Note. $\sum_{j=1}^n (a_j - a_{j-1}) = a_n - a_0$, where a_0, a_1, \dots, a_n is a sequence of real numbers. This type of sum is called telescoping.

Solutions

Question 5. Show that the set $Z^+ \times Z^+$ is countable.

Solutions

Question 6. The $n \times n$ matrix $A = [a_{ij}]$ is called a **diagonal matrix** if $a_{ij} = 0$ when $i \neq j$. Show that the product of two $n \times n$ diagonal matrices is again a diagonal matrix. Give a simple rule for determining this product.

Solutions