

CISC 2210 Spring 2018 Quiz 1

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February 27, 2018

1 Basic Set Question

List the elements in the following sets:

1. $\{q \in \mathbb{Q} : q^2 < 0\}$
2. $\{p \in \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\} : p = 2k \text{ for some } k \in \mathbb{P}\}$

2 Set operations

Let $A = \{1, 2, 3\}$, $B = \{a, b\}$, and $C = \{2, 4, 6, 8, 10\}$.

Find:

1. $\mathcal{P}(A)$
2. $|\mathcal{P}(A) \times \mathcal{P}(B)|$
3. $B \times A$
4. $A \cap C$

3 Proofs

3.1

Prove that for any three sets A and B, it is true that $(A \cup B)^c \subseteq (A^c \cap B^c)$.

3.2

Prove or disprove: For any 2 sets A and B, $A \setminus B = B \setminus A$. If it is true, you must explain why it's always true. If it is false, provide a counterexample.

4 Functions and Sequences

4.1

Let $S = \{0, 1, 2\}$ and let $f : S \rightarrow \mathbb{N}$ be defined by $f(s) = 10 - s$. Find:

1. $\text{Im}(f)$

2. $\text{Graph}(f)$

4.2

Let $f(x) = x^2 - x$. Find $(f \circ f)(x)$

5 Sequences

Let $(S_n)_{n \in \mathbb{P}}$ be defined by the rule $S(n) = \prod_{i=1}^n \frac{i}{i+1}$.

Find:

1. $S(1), S(2), S(3)$

2. Explain why $S(n) = \frac{1}{n}$.