Math/CS 1019
Homework 3
Due May 26, 2010

1. Explain why (A x B) x (C x D) and A x (B x C) x D are not the same.

2. Find the truth set of each of these predicates where the domain is the set of integers.

  (a) $P(x):$ "$x^3 \geq 1$"

  (b) $Q(x):$ "$x^2 = 2$"

  (c) $R(x):$ "$x < x^2$"

3. Find the power set of $\{a, b, c\}$.

4. Prove that for all sets A, B, and C,

$$(A - B) - C \subseteq A - C$$

5. Draw the Venn diagram for $A \cap (B \cup C)$.

6. Give an example of a function from $\mathbf{N}$ to $\mathbf{N}$ that is

  (a) one-to-one but not onto

  (b) onto but not one-to-one

  (c) both onto and one-to-one (but different from the identity function)

  (d) neither one-to-one nor onto

7. For each of these lists of integers, provide a simple formula or rule that generates the terms of an integer sequence that begins with the given list. Assuming that your formula or rule is correct, determine the next three terms of the sequence.

  (a) $1, 0, 0, 1, 1, 1, 0, 0, 0, 0, 1, 1, 1, 1, 1, \ldots$

  (b) $1, 3, 15, 105, 945, 10395, 135135, 2027025, 34459425, \ldots$

  (c) $2, 4, 16, 256, 65536, 4294967296, \ldots$

  (d) $1, 2, 2, 2, 3, 3, 3, 3, 3, 5, 5, 5, 5, 5, 5, 5, \ldots$

  (e) $0, 2, 8, 26, 80, 242, 728, 2186, 6560, 19682 \ldots$

8. Show that the union of two countable sets is countable.