Integrated MTech MFCS Quiz-1
8 Jan 2015 Due: 15 Jan 2015

1. A hospital keeps records on 1000 patients admitted in a year. The data consists of their name, address, DOB, date of admission, date of discharge, condition diagnosed, whether the treatment was successful or not.
   Give a description of the cartesian product of the sets in which each record lies. Let $U_i(r)$ denote the i-th entry of the record r, express the following in set builder notation:

   a the set of patients who were admitted more than once in the year

   b the set of illnesses diagnosed.

   c the set of illnesses successfully treated.

2. Determine which of the following sets are equal, finite and infinite.

   (a) $\{x \in R : 1 < x < 2\}$
   (b) $\{x \in Z : x^2 + 2 < 3x\}$
   (c) $\{x : x = 1 \; or \; x = 2\}$
   (d) {2, 1, 2, 1, 2}
   (e) $\{x \in R : |x - 3/2| < 1/2\}$
   (f) $\{x \in R : x^3 < 8\} \cap \{x \imath R : x^5 > 1 \; \}$

3. Which of the following are true for all sets A, B and C? Either prove or give a counter example.

   (a) $(A - B) \cap C = (A \cap C) - B$
   (b) $A - (B \cap C) = (A - B) \cap (A - C)$
   (c) $(A - B) - C = A - (B - C)$

4. Let $A = \{a, \{b\}\}$ and $B = \{a, b, \{a, b\}\}$. Determine $A \cap B$, $P(A)$, $A \times B$.

5. Use DeMorgan's laws to prove that the complement of $(\bar{A} \cap B) \cap (A \cup \bar{B}) \cap (A \cup C) = (A \cup \bar{B}) \cup \bar{A} \cap (B \cup \bar{C})$