MATH/EECS 1028: DISCRETE MATH FOR ENGINEERS WINTER 2015 Tutorial 1 (Week of Jan 12, 2015)

Notes:

- 1. Assume \mathbb{R} to denote the real numbers, \mathbb{Z} to denote the set of integers $(\ldots, -2, -1, 0, 1, 2, \ldots)$ and \mathbb{N} to denote the natural numbers $(1, 2, 3, \ldots)$.
- 2. Topics: Number systems, quadratic equations, exponents, sets, set operations.
- 3. Attendance will be taken each week. There is nothing to be submitted this week.
- 4. In the tutorials next week they have to submit a couple of questions that are very similar to the ones done this week.

Questions:

- 1. Simplify: $5 \times (3^{2x} 9^x \times 5^{-1}) \times 2^{-2}$
- 2. Solve the equation: $9^x 5 \times 3^x + 4 = 0$.
- 3. Solve the equation: $9^{x^2} = 27^{3x-3}$.
- 4. Are these statements correct? Why or why not?
 - (a) $\{\{1\}\} = \{1\}$
 - (b) $\emptyset \neq \{\emptyset\}$
 - (c) $\emptyset \in \{\emptyset\}$
 - (d) $\emptyset \in \{\{\emptyset\}\}$
 - (e) $\emptyset \subseteq \emptyset$
 - (f) $\emptyset \subseteq \{\emptyset\}$
 - $(g) \ \{\{\emptyset\}\} \subset \{\emptyset, \{\emptyset\}\}$
- 5. Enumerate the following sets
 - (a) The power set of $\{\emptyset, \{a\}\}$
 - (b) A^3 when $A = \{a\}$.
 - (c) $A \times B \times C$, $(A \times B) \times C$ when $A = \{a\}, B = \{b\}, C = \{c\}$.
- 6. Show that
 - (a) If A is a set $A \times \emptyset = \emptyset \times A = \emptyset$.
 - (b) If A, B, C, D are sets and $A \subseteq B, C \subseteq D$ then $A \times C \subseteq B \times D$.
- 7. (a) Suppose that A, B are sets and $A \times B = \emptyset$. What can you conclude about A, B?

- (b) What is the cardinality of $\{\{a, b\}, \{c, d\}\}$?
- 8. Prove that $\sqrt{3}$ is not rational.
- 9. Draw the Venn diagram for the set $A \cap (B C)$
- 10. What can you say about the sets ${\cal A}, {\cal B}$ if
 - (a) $A \cup B = A$
 - (b) $A \cap B = A$
 - (c) $A \cup B = B \cup A$
 - (d) A B = A
 - (e) A B = B A