MATH/EECS 1028: Discrete Math for Engineers
Winter 2015
Assignment 1 (Released February 6, 2015)
Submission deadline: 1:15 pm, Feb 21, 2015

Notes:

1. The assignment can be handwritten or typed. It MUST be legible.

2. You must do this assignment individually.

3. Submit this assignment only if you have read and understood the policy on academic honesty on the course web page. If you have questions or concerns, please contact the instructor.

4. Use the dropbox near the EECS main office to submit your assignments, OR submit your assignment in the first TEN minutes of class on the day of the deadline. No late submissions will be accepted. Please do not send files by email.

5. Your answers should be precise and concise. Points may be deducted for long, rambling arguments.

6. 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 $(1, 2, 3, \ldots)$.

Question 1

[4 points] Prove that $\log_3 \pi + \log_\pi 3 > 2$. Do not use a calculator, or a lookup table to compute numerical values of the logarithms.

Question 2

[4 points] Prove that $\log_{10} 7$ is irrational.

Question 3

[4 points] Let $n \in \mathbb{N}$. Prove using induction the inequality $\frac{1}{n+1} + \frac{1}{n+2} + \ldots + \frac{1}{3n+1} > 1$.

Question 4

[2 + 1 + 2 points] Suppose that the letters of the English alphabet are listed in an arbitrary order.

1. Prove that there must be four consecutive consonants.

2. Give a list to show that there need not be five consecutive consonants.

3. Suppose that all the letters are arranged in a circle. Prove that there must be five consecutive consonants.

Question 5

[1+2 points] The function $f : \mathbb{R} \to \mathbb{R}$ satisfies $f(f(x)) - f(x) = x$. Is f injective? Why? Find all values of x such that $f(f(x)) = 0$.