CS 230 : Discrete Computational Structures

Spring Semester, 2019

ASSIGNMENT #3

Due Date: Monday, February 11

Suggested Reading: Rosen Sections 1.7 - 1.8; Lehman et al. Chapter 1

These are the problems that you need to turn in. For more practice, you are encouraged to work on the other problems. Always explain your answers and show your reasoning.

1. [**5 Pts**] Prove that the sum of three consecutive integers is divisible by 3.
2. [**8 Pts**] Prove or disprove that for all integers p, p is even if and only if p^3 is even.
3. [**6 Pts**] Prove, using a direct proof that $x + yz$ is rational if x, y and z are all rational numbers.
4. [**6 Pts**] Let x and y be non-zero rational numbers and let z be an irrational number. Prove that xyz is irrational. Can you use a direct proof? Why or why not?
5. [**6 Pts**] Let n be an integer. Prove, by contrapositive, that if $3n + 11$ is even, then n is odd.
6. [**6 Pts**] Suppose a piano teacher schedules 40 lessons over the week. Prove that she will have to schedule at least 6 on some day.
7. [**7 Pts**] Prove that the square root of 7 is irrational.
8. [**6 Pts**] Prove that there exist x and y where x is irrational and y is a non-zero rational, but x^y is rational. Is your proof constructive or non-constructive? Explain.

For more practice, you are encouraged to work on the problems given in Rosen, Sections 1.7 - 1.8 and in LLM Chapter 1.