CS 230 : Discrete Computational Structures

Spring Semester, 2021
HOMEWORK ASSIGNMENT #3
Due Date: Monday, February 22

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

For the problems below, explain your answers and show your reasoning.

1. **[5 Pts]** Prove, using a direct proof that p is odd if and only if p^3 is odd.
2. **[6 Pts]** Let x and y be non-zero rational numbers and let z be an irrational number. Prove that $x + yz$ is irrational. Can you use a direct proof? Why or why not?
3. **[6 Pts]** Let m and n be positive integers. Prove, by contrapositive, that if $mn > 35$, then $m \geq 6$ or $n \geq 8$.
4. **[6 Pts]** Suppose your college organization has 32 students. Prove that it has at least 5 freshmen or at least 8 sophomores or at least 10 juniors or at least 7 seniors.
5. **[6 Pts]** Prove by cases that if $p \geq 3$ or $p \leq -7$ then $(p + 2)^2 \geq 25$.
6. **[6 Pts]** Prove that the square root of 5 is irrational.
7. **[5 Pts]** Prove that there exist rational numbers x and y where x^y is irrational. Is your proof constructive or non-constructive? Explain.

For more practice, work on the problems from Rosen Sections 1.7 - 1.8 and LLM Chapter 1.