

CSCI 1311: Problem Set 3

Early Deadline: 15 Feb 2023

Final Deadline: 17 Feb 2023

Instructions:

- You will submit your answers to via gradescope.
- Refer to gradescope to determine which questions or sub-questions are submitted individually.
- For each submission of a question or sub-question, you should submit an image of your answer, which can be a picture of your handwriting, a screenshot of a tablet, an image of something you typed, or a scan of a document. The most important point is that it's legible and clearly marked in gradescope.
- Submission by the *Early Deadline* will receive a 10 point bonus. Submission after the *Final Deadline* will not be accepted.
- You may ask to use your *one time amnesty* for this assignment to receive two additional days past the *Final Deadline*.

Question Weighting

Question:	1	2	3	4	5	6	Total
Points:	10	15	15	20	20	20	100

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1. [10 points] Prove that for any positive integer n , if n is even, then n^3 is even.
 2. [15 points] Prove that for all integers n can, there exists a q such that $n^4 = 8q + 1$ or $n^4 = 8q$.
 3. [15 points] Prove that for all integers $n > 4$, if n is prime then $n = 6q + 1$ or $n = 6q - 1$ where $q \geq 1$.
 4. [20 points] Prove that there does not exist two primes greater than 4 that have a difference of 3, that is $|p - q| \neq 3$ for all primes p and q greater than 4. (*Hint: There are a few ways to do this, but you can also use the result from the prior question to prove this one*)
 5. [20 points] Prove that, for all integers $n > 1$ and prime p , $p|n$ if, and only if, $p|n^2$.
 6. [20 points] Prove that $\sqrt{7}$ is irrational.
(*Hint: you can use the result from the previous question to prove this one*)