

CSCE-433 Formal Languages & Automata

CSCE-627 Theory of Computability

Spring 2022

Instructor: Dr. Jianer Chen

Office: PETR 428

Phone: 845-4259

Email: chen@cse.tamu.edu

Office Hours: MWF 10:30–11:30am

Senior Grader: Avdhi Shah

Office: N/A

Phone: tba

Email: avdhi.shah@tamu.edu

Office Hours: tba

Assignment # 1

(Due February 2, 2022)

Instructions.

- Your assignment must be typed using your favorite word processor. You may draw diagrams by hand, but only if you are very neat and the diagram is legible.
- Turn in a PDF file of your homework on Canvas.
- Homework is always due at the **beginning** of the class on the due day.

Questions.

1. Prove by induction: $1^2 + 3^2 + 5^2 + \cdots + (2n - 1)^2 = (4n^3 - n)/3$
2. Prove by induction: For every integer $n \geq 0$, $5^{2n+1} + 2^{2n+1}$ is divisible by 7.
3. Prove by contradiction: For any integers a, b, c , if $a^2 + b^2 = c^2$, then at least one of a and b is an even number;
4. Prove by contradiction: (a) For any integer n , if n^2 is divisible by 6, then n is also divisible by 6; (b) $\sqrt{6}$ is an irrational number. Both (a) and (b) should be proved by contradiction.
5. [CSCE-433 Students only] Suppose that n straight lines are drawn in the plane such that no two lines are parallel and no three lines go through the same point. These lines divide the plane into r_n regions. Prove: $r_n = 1 + n(n + 1)/2$.
6. [CSCE-627 Students only] Prove that every simple graph (i.e., a graph with no self-loop and multiple edges) with two or more vertices contains two vertices that have equal degrees.

Further suggested practice. Textbook: Problems 0.10 and 0.12 (page 27).