Name: _____

1. (1 pt.)

   ○ **Read all material carefully.**
   ○ *If in doubt whether something is allowed, ask, don't assume.*
   ○ You may refer to your books, papers, and notes during this test.
   ○ E-books may be used *subject to the restrictions* noted in class.
   ○ Computers are not permitted, except when used strictly as ebooks.
   ○ Network access of any kind (cell, voice, text, data, ...) is not permitted.
   ○ Write, and draw, carefully. Ambiguous or cryptic answers receive zero credit.
   ○ Use class and textbook conventions for notation, algorithmic options, etc.

   Write your name in the space provided above.

2. (9 pts.) Prove or disprove: For every natural number $n > 4$, there exists a *4-regular graph* with n vertices. [Hint: Chapter 0.]

3. (5 pts.) Provide a formal definition of the language consisting of strings over the alphabet $\{a, b, c, d\}$ in which every occurrence of `b` is followed by (immediately) `cd` **and** the second-from-last letter (second position from the right of the string) is either `a` or `d`.

4. (15 pts.) Provide a NFA that recognizes the language of Question 3, or prove that no such NFA exists: *Prove, as precisely as possible,* that the NFA recognizes the language. [Hint: Use a method similar to that used in a recent class meeting.]

[additional space for answering the earlier question]

5. (15 pts.) Provide a DFA that is equivalent to the NFA of Question 4. *Prove the equivalence, as precisely as possible.*