**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.
   - No computer or network access of any kind is allowed (or needed).
   - Write, and draw, carefully. Ambiguous or cryptic answers receive zero credit.
   - Use class and textbook conventions for notation, algorithmic options, etc.
   - Budget your time: roughly one minute per point.

   Read the above carefully; then write your name in the space provided above.

2. (14 pts.) Trace the operation of BFS, with initial vertex A, on the following graph using the conventions of Figure 22.3 in the textbook. Be sure to highlight the edges of the resulting BFS tree.
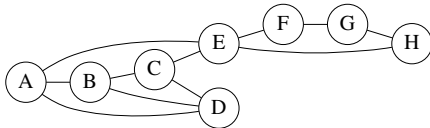
[additional space for answering the earlier question]

[additional space for answering the earlier question]

3. (25 pts.) Trace the execution of the textbook's SLOW-ALL-PAIRS-SHORTEST-PATHS algorithm (p. 689) on the following directed graph, using the textbook's Fig. 25.1 (p. 690) as a guide.
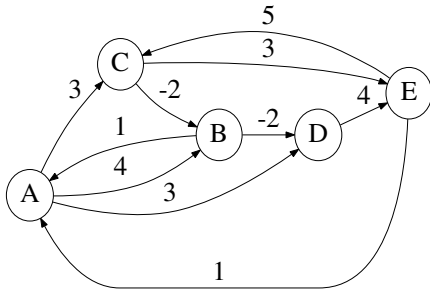
[additional space for answering the earlier question]

4. (30 pts.)

    (a) Reduce the following instance of 3-CNF-SAT to an instance of SUBSET-SUM by using the reduction described in class.

    (b) Solve the SUBSET-SUM instance using any method, but explain your answer.

    (c) Use the above solution to solve the 3-CNF-SAT instance, explaining your answer.

$$(x_1 \lor \neg x_2 \lor x_3) \land (\neg x_1 \lor x_2 \lor \neg x_3) \land (x_1 \lor \neg x_2 \lor \neg x_4) \land (\neg x_1 \lor x_2 \lor x_4)$$

[additional space for answering the earlier question]

[additional space for answering the earlier question]

[additional space for answering the earlier question]