Please complete this worksheet by October 25th, 2021 by 11:59 pm.

Once you upload a picture of your work (here), the solutions will become available so you can study for the weekly quizlet, which may draw one problem from this week’s worksheets.

Problem 1

From Discrete Mathematics and Its Applications (Rosen, 5th Ed.) The following algorithm can be used to color a simple graph:

- List all the vertices in order of decreasing degree, i.e. re-order the vertices such that \( \text{deg}(v_1) \geq \text{deg}(v_2) \geq \text{deg}(v_3) \geq \cdots \geq \text{deg}(v_n) \).
- Assign color 1 to \( v_1 \) (the vertex with the highest degree), as well as to the next vertex in the list not adjacent to \( v_1 \) (if possible). Keep assigning color 1 to all vertices in this list not adjacent to a vertex that already has color 1.
- Now assign color 2 to the first vertex in the list that is not colored, and proceed down the list as in the last step (this time, coloring vertices that are not adjacent to a vertex with color 2).
- Keep doing this, introducing new colors, until all vertices have been colored.

(a) Construct a coloring of the following graph using this algorithm.

(b) Write out pseudocode that describes this algorithm. You can assume that the input vertices are already ordered by decreasing degree.