

Directions: Solve the following problems. All written work must be your own. See the course syllabus for detailed rules.

1. [2.1.{25,26}] Recall that the *slope* of the line segment joining the pair of points (x_1, y_1) and (x_2, y_2) in the plane is $(y_2 - y_1)/(x_2 - x_1)$.
 - (a) Prove that if S is a set of 17 points in the plane, no two of which are on a common vertical or horizontal line, then there exist $p_1, \dots, p_5 \in S$ such that the slope of the line segments joining p_i and p_j for $1 \leq i < j \leq 5$ all have the same sign.
 - (b) Give an example that shows that the conclusion of part (a) does not always hold if we assume only that $|S| \geq 16$.
2. [2.2.3] **Note: This question is moved to HW5.** What is the maximum number of edges in an n -vertex bipartite graph? Prove your answer is correct.
3. [2.2.6] **Note: This question is moved to HW5.** Each of 9 users sends three friend requests on a social media platform. Is it possible that each person p receives exactly 3 friend requests from the same three people to whom p sent the requests? What if the number of users is 8 instead?