Non-Perpendicular Vectors

Answer the following problems and SHOW ALL WORK. All problems require a drawing.

1. U.S. Highway 212 extends 55 km at 37° north of east between Newell and Mud Butte, South Dakota. It then continues for 66 km due east from Mud Butte to Faith, South Dakota. If you drive along this part of U.S. Highway 212, what will be your total displacement?

2. Wrigley Field is one of only three original major-league baseball fields that are still in use today. Suppose you want to drive to Wrigley Field from the corner of 55th Street and Woodlawn Avenue. Although not the fastest or most direct route, the most straightforward way to reach Wrigley Field is to drive 4.1 km west on 55th Street to Halsted Street, then turn north and drive 17.3 km on Halsted until you reach Clark Street. Turning on Clark, you will reach Wrigley Field after traveling 1.2 km at an angle of 24.6° west of north. What is your resultant displacement?

3. A bullet traveling 850 m East ricochets from a rock. The bullet travels another 640 m, but at an angle of 36° north of east. What is the resultant displacement of the bullet?

4. The cable car system in San Francisco is the last of its kind that is still in use in the United States. It was originally designed to transport large numbers of people up the steep hills on which parts of the city are built. If you ride seven blocks on the Powell Street cable car from the terminal at Market Street to Pine Street, you will travel east 2.00 \times 10^2 m on level ground, then 3.00 \times 10^2 m at an incline of 30.0° north of east, and finally 2.00 \times 10^2 m at 38.8° north of east. What will be your resultant displacement?

5. The city of Amsterdam, in the Netherlands, has several canals that connect different sections of the city. Suppose you take a barge trip to the harbor, starting at a point near the northwest corner of the Vondel park. You would sail 2.50 \times 10^2 m at 58.5° north of east, 375 m at 21.8° north of east, and 875 m at 21.5° west of north. What would be your resultant displacement?