

## VECTOR WORKSHEET 2

**DIRECTIONS 1**: Solve the following problems **GRAPHICALLY on graph paper**. Be sure to label vectors and resultants with both magnitude and direction. Box your final answer.

**DIRECTIONS 2**: Solve the following problems **TRIGONOMETRICALLY** using the component method of vector addition. Be sure to space and organize your work so that it can be easily read. Box your final answer.

1. The southernmost point in the United States is called South Point, and is located at the southern tip of the large island of Hawaii. A plane designed to take off and land in water leaves South Point and flies to Honolulu, on the island of Oahu, in three separate stages. The plane first flies 83.0 km at  $22.0^\circ$  west of north from South Point to Kailua Kona, Hawaii. The plane then flies 146 km at  $21.0^\circ$  west of north from Kailua Kona to Kahului, on the island of Maui. Finally, the plane flies 152 km at  $17.5^\circ$  north of west from Kahului to Honolulu. What is the plane's resultant displacement? *(345 km,  $48.6^\circ$  N of W)*
2. An Arctic tern flying to Antarctica encounters a storm. The tern changes direction to fly around the storm. If the tern flies 46 km at  $15^\circ$  south of east, 22 km at  $13^\circ$  east of south, and finally 14 km at  $14^\circ$  west of south, what is the tern's resultant displacement? *(66 km,  $46^\circ$  S of E)*
3. The elevated train, or "L," in Chicago is a major source for mass transit in that city. One of the lines extends from Jefferson Park, in the northwest part of town, to the Clark Street station downtown. The route of this line runs 5.0 km at  $36.9^\circ$  south of east, 1.5 km due south, 8.5 km at  $42.2^\circ$  south of east, and 0.8 km due east. What is the resultant displacement of an "L" train from Jefferson Park to Clark Street? *(15.1 km,  $42.6^\circ$  S of E)*
4. A billiard table is positioned with its long side parallel to north. A cue ball is then shot so that it travels 1.41 m at an angle of  $45.0^\circ$  west of north, is deflected by the table's left side, and continues to move 1.98 m east of north at an angle of  $45.0^\circ$ . The ball is then deflected by the table's right side, so that it moves 0.42 m west of north at an angle of  $45.0^\circ$ . After a reflection on the north end of the table, the ball travels 1.56 m at an angle of  $45.0^\circ$  south of west. Determine the resultant displacement of the cue ball. *(1.88 m,  $58.1^\circ$  N of W)*
5. Hurricane Iniki was the most destructive cyclone to have crossed the Hawaiian Islands in the twentieth century. Its path was also unusual: it moved south of the islands for 790 km at an angle of  $18^\circ$  north of west, then moved due west for 150 km, turned north and continued for 470 km, and finally turned back  $15^\circ$  east of north and moved 240 km to cross the island of Kauai. What was the resultant displacement of Hurricane Iniki? *(1260 km,  $48^\circ$  N of W)*