Problem: Navigating Suzhou's Canals with Radar

Suzhou's intricate network of canals makes it a popular destination for boat tours. A new boat company uses a state-of-the-art radar system to ensure safe navigation through the canals. The radar screen represents a unit circle, with the boat's location at the origin.

On a foggy morning in Suzhou, the radar detects another boat at a distance of 1 unit (the edge of the radar screen) at an angle of 30° counter-clockwise from the positive x-axis.

  a) What are the x and y coordinates of this boat on the radar screen?

Later, the radar detects a stationary object directly southeast from the boat and lying on the unit circle.

  b) Determine the angle this object makes with the positive x-axis. Also, find its x and y coordinates on the radar.

During the tour, the boat operator notices a group of boats gathering for a festival. The radar shows the center of this group at coordinates (-0.866, -0.5) on the radar screen.

  c) What angle do these coordinates make with the positive x-axis, and in which general direction (e.g., northeast, southwest) is the festival gathering from the boat's current position?