Application of Vectors: Detailed Computational Analysis

1. **We will do as a class** Set up a Microsoft Excel spreadsheet to analyze the velocity of an object undergoing a constant acceleration in two dimensions (might help to visualize a boat on the water being blown by the wind). To analyze this you will have to calculate the final velocity at 0.1s intervals (called a time step) for the first 10 seconds. Make it so the initial velocity and acceleration can be adjusted. The components, magnitude, and direction of the final velocity should be displayed. Note, when graphing label your axes and title your graph.
    a. Make the $\vec{v}_o$ = 15 m/s [E30°S] and $\vec{a}$ = 6.5 m/s^2 [W60°N]
    b. Graph the components of $\vec{v}_f$ versus time on the same set of axis.
    c. Graph the magnitude of $\vec{v}_f$ versus time.
    d. Graph the angle versus time.

2. **Your Assignment** Program the Excel sheet to analyze the final position, $\vec{d}_f$, and its components. Have it so $\vec{d}_o$ can be adjusted, but to start have $\vec{d}_o$ = 0.0 m [E0°N].
    a. Graph d_{fE} versus d_{fN} (that is the actual path taken by the object).
    b. Graph $\vec{d}_f$ versus time.
    c. Change $\vec{d}_o$ = 35 m [E62°S]

3. Two fishing boats are out at sea. From port boat 1 is located 525 m [E36°S] and drifting 8.5 m/s [E55°N]; boat 2 is 355 m [W35°S] and drifting 7.8 m/s [W70°N]. At the same instant both boats begin to accelerate: Boat 1 at 1.6 m/s^2 [W40°N] and Boat 2 at 2.1 m/s^2 [E60°N]. The acceleration lasts for 60 seconds.
    a. Use Excel to generate the positions of both boats at 1.0 second intervals.
    b. Graph d_{fE} versus d_{fN} for both boats on the same set of axis.
    c. Did the boats collide?