1 Sailing distance

(a) You sail 3 nautical miles 10° north of west and 7 nautical miles due north.

- Construct vectors that model the legs of your journey.
- How far are you from where you started?

(b) Time to head back

- Construct a vector that represents your return trip.
- Add the three vectors you have constructed.
- Explain why the sum is reasonable in terms a sailor can understand.

2 Bennu

Bennu is an asteroid whose orbit can be modeled by $0.8x^2 + 1.8y^2 = 1.5$ where x and y are in astronomical units.

- To which asteroid group does Bennu belong?
- Construct $d\vec{r}$ for Bennu Cartesian coordinates.
- Construct $d\vec{r}$ for Bennu in polar coordinates.
- What is $d\vec{r}$ at Bennu's aphelion?
- The angle between $\vec{r}$ and $d\vec{r}$ changes as Bennu travels its orbital path. Describe how you could calculate where the angle is smallest in measure.