Working in a group of 2–3 people, complete 1 of the following problems. After 50 minutes have elapsed, submit your solutions to your workshop instructors. You should be able to do the other problems—use them for practice!

Your group's work will be graded on correctness, but more of your grade will depend on communication. Consider workshops as practice for your written assignments. Writing legibly (including well-labelled graphs), using complete sentences, and fully explaining your thoughts in a logical order will earn high marks.

1. Find the points on the ellipse \( \frac{x^2}{4} + y^2 = 1 \) that are nearest to and farthest from the point \((1,0)\).

2. The energy expenditure of a fish swimming with velocity \( v \) a distance \( L \) against a current \( u \) is given by

   \[ E = av^3 \frac{L}{v-u}. \]

   At what velocity should the fish swim to minimize its energy expenditure?

3. Two sources of heat are placed \( s \) meters apart—a source of intensity \( a \) at \( A \) and a source of intensity \( b \) at \( B \). The intensity of heat at a point \( P \) on the line between \( A \) and \( B \) is given by the formula:

   \[ I = \frac{a}{x^2} + \frac{b}{(s-x)^2} \]

   where \( x \) is the distance from \( A \) to \( P \). At what distance \( x \) from \( A \) does the minimum heat intensity occur? (You don’t have to answer this for the workshop, but is the physics of this correct? Wikipedia: Inverse square law).

After you finish these problems, please submit your work to your workshop instructors. In the remaining 30 minutes of workshop, make the most of the available time and help.