Working in a group of 2–3 people, complete either problems 1 and 2 or one of 3 or 4 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. 

How do you know if you have found a max or a min?

1. A farmer has 400m of fencing materials. What is the largest rectangular paddock that can be built with a fence dividing the paddock into two equal parts?

2. A farmer has 400m of fencing materials. What is the largest rectangular paddock that can be built with a fence dividing the paddock into two equal parts given that both parts of the paddock face a lake (and hence don’t need a fence).

3. Optimize the dimensions of a tin can to minimize the surface area.

4. Optimize the shape of an open-topped rectangular box to maximize the volume.

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.

(Bonus marks available for #4 — need to explain which critical number gives the maximum.)