# Lab 2

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Note: Unless specifically asked to submit a solution, just work on the exercises and keep track of your progress in your journal.

Note: it is a good idea to make of copy of the step-xy directory (call it my-step-xy for example) and keep the original one around.

Note: You will end up creating different images when doing the following tasks. You might want to copy some of those into your journal (to practice how to do that and so that you can compare them easily).

Note: You will need the deal.II Documentation available at `https://www.dealii.org/current/doxygen/deal.II/index.html`.

1. Make yourself familiar with step-1 (I added a copy of step-1 to the class github repository) and looking up help about deal.II. The step-1 documentation is at `https://www.dealii.org/current/doxygen/deal.II/step_1.html`. Go read it. There are also video lectures linked that are created by a colleague of mine.

2. Run the program without modifications and look at the .svg files (any browser should be able to display them).

3. Add a call to `triangulation.reset_all_manifolds();` to `second_grid()` before the for loop. What happens now?

4. Create an image of an L-shape domain (add a third function to step-1). Refine this mesh adaptively around the re-entrant corner 4 times and visualize it.

5. Create a mesh for a 3d cylinder and output it. Notice that .svg is probably not a good format, so figure out a way to generate a .vtu file, which you can visualize in ParaView (`paraview.org`).

6. Create a helper function that takes a `Triangulation` and outputs the following information: number of levels, number of active cells. Test this with all the meshes you have looked at so far.

7. Extend the function to check whether a mesh is conforming (you can check the *level* of a *neighbor* of a *cell*, ...). Test it on the existing functions you wrote.

8. Bonus: Create an L-shaped domain in 2D and extrude it into 3D. There is a function in `GridGenerator` for that.