Lab 4

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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: 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-3 (I added a copy of step-3 to the class github repository). The step-3 documentation is at `https://www.dealii.org/current/doxygen/deal.II/step_3.html`. Go read it. There are also video lectures linked that are created by a colleague of mine.

2. Follow the instructions in "Modify the type of boundary condition" in the description of the tutorial.

3. Now also do "A slight variation of the last point" but use the value -2.0 for the boundary with indicator 1.

4. Change the setup in 3) to have $f = 0$. For a change, use paraview to visualize the output (try to use the "warp by scalar" filter).

5. Change the problem to a function f that depends on the position in the domain. Use $f = 1$ for $x > 0$ and $f = 0$ otherwise. **Submit your .cc file with this change on Canvas** (it doesn't matter to me if you include the changes from 2/3 here).

6. In 3) we have a discontinuous boundary in two corners. How are the "conflicting" values in the corner handled? You can observe what is going on by printing the entries in the `boundary_values` map. Using a coarser mesh might help here.

7. Do "Convergence of the mean" and confirm the order h^2. Bonus: Increase the polynomial order (you need to increase all orders of the quadratures in the program!) and check the convergence of the mean now.