Task 1

For task 1 I used, as demanded in the task description, PINNs to solve the problem. The structure of the PINN is from the tutorials (`Pinns.ipynb`). I decided to go with a DNN with 2 outputs corresponding to the fluid and solid temperature. The DNN has 5 hidden layers with each 30 nodes. The structure of the DNN is from the `Common.py` file also introduced in the tutorials. I adjusted the `compute_pde_residual` function to our PDE and added the function `compute_sb_residual` where the boundary conditions are enforced. In the compute_loss function, I added the corresponding residuals from the previously mentioned functions. There are 512 interior sample points used (from a Sobol sequence) as well as 128 on the temporal boundary and 128 on each of the spatial boundaries. The parameter lambda balances the pde and the boundary loss. It is chosen to be 2.5 such that there is more focus on the boundary but the pde loss is still small enough. The model was trained over 1000 epochs with the ADAM optimizer and then over 2 epochs (i.e. a couple thousand iterations) with the LBFGS optimizer. The code was executed on Google Colab (without using their GPUs).