A Overview of Appendices

We provide supplementary details about problems and experiments for the main text in the Appendix. In Appendix B, we provide mathematical descriptions and visualization for all PDEs in this paper. In Appendix C, we list the detailed hyperparameters and training/testing settings. In Appendix D, we provide a high-level overview of the codebase of the toolbox. In Appendix E, the results for the main experiments, i.e., the performance of L2RE, L1RE, MSE, and runtime for all methods on all PDEs are displayed. In Appendix F, we show the visualization results for several methods on some problems. The code and datasets could be found in `https://github.com/i207M/PINNacle`.

B Details of PDEs

Here provide details of PDE tasks used for evaluating different variants of PINNs. Denote u to be the function to solve and x, t to be spatial and temporal variables.

1. One-dimensional Burgers Equation (Burgers1d)

The Burgers 1D equation is given by

$$u_t + uu_x = \nu u_{xx}. \tag{6}$$

The domain is defined as

$$(x, t) \in \Omega = [-1, 1] \times [0, 1]. \tag{7}$$

The initial and boundary conditions are

$$u(x, 0) = -\sin \pi x, \tag{8}$$
$$u(-1, t) = u(1, t) = 0. \tag{9}$$

The parameter is

$$\nu = \frac{0.01}{\pi}. \tag{10}$$

2. 2D Coupled Burgers equation (Burgers 2d)

The 2D Coupled Burgers equation is given by

$$\boldsymbol{u}_t + \boldsymbol{u} \cdot \nabla \boldsymbol{u} - \nu \Delta \boldsymbol{u} = 0, \tag{11}$$
$$\boldsymbol{u}(0, y, t) = \boldsymbol{u}(L, y, t), \quad \boldsymbol{u}(x, 0, t) = \boldsymbol{u}(x, L, t), \tag{12}$$
$$\{x, y\} \in [0, L], \quad t \in [0, T], \tag{13}$$

The domain is defined as

$$(x, y, t) \in \Omega = [0, L]^2 \times [0, 1]. \tag{14}$$

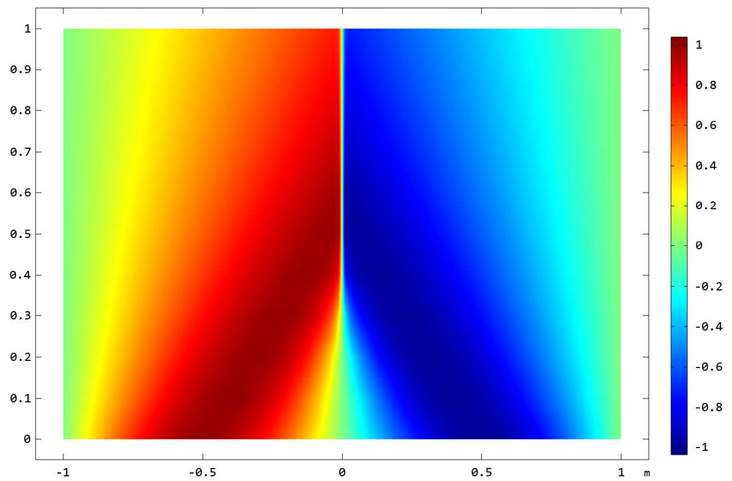

Figure 4: Reference solution of Burgers1d using FEM solver.