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Homework 4: Partial Differential Equation

1. The Advection Equation

As the requirement, the advection equation can be discretized as followed, where the time is approximated as forward differentials and spatial is approximated as center difference.

As for the stability and its relationship with , we can know by decomposing it in accord with Fourier transformation.

Because of ,

As the calculated above, there exists the possibility of instability, because the value of cannot grantee the stability condition. The bigger the value of is, the more possible to reach instability, such as 0.2.

1. The Poisson Equation

With the discretization, we can transform it into followed form.

As, we can further simplify the equation above.

Then we can write down the simultaneous equations and it can be solved by using the iteration methods, such as Jacobi method.

**By the way, I have answered the class questionnaire.**