

Project proposal for **Numerical Methods** course.

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1 Title

Solution of Diffusion Equation $\partial u/\partial t = constant(\nabla^2 u)$.

1.1 Numerical Methods to be learned

I wish to learn how to solve partial differential equation numerically. The methods of solving such equation, which I would like to study are :-(a) **Leap Frog**, (b) **Crank-Nicholson** and (c) **Alternating Direction Implicit** – under the **Finite Difference** method. The **Finite Difference** method would be used to bring the diffusion equation in tridiagonal form thus reducing the order of operation. Thus the advantages and disadvantages of each method can be studied with respect to stability and other factors.

1.2 Project plan

In order to study the methods named previously, I would like to begin with heat flow in one dimension, taking the example of heat flow in a metal rod. Using method (a) and (b), the temperature distribution at various places of the rod is to be computed and plotted, varying parameter like time step. Lastly, I would try to solve the diffusion equation in two dimension using the method (c) named in section (1.1).