

Introduction to Week Six

Numerical Solutions of PDEs

Direct Solution of Boundary Value Problems

✔ **Video:** Discrete Laplace Equation | Lecture 62  
9 min

✔ **Reading:** Mean Value Property of the Laplace Equation  
10 min

▶ **Video:** Natural Ordering | Lecture 63  
8 min

📄 **Reading:** Coordinates of the four corners  
5 min

▶ **Video:** Matrix Formulation | Lecture 64  
12 min

📄 **Reading:** The Discrete Laplace Equation on a Four-by-Four Grid  
10 min

📄 **Reading:** Number of Interior and Boundary Points  
10 min

▶ **Video:** MATLAB Solution of the Laplace Equation (Direct Method) | Lecture 65  
17 min

🔗 **Ungraded External Tool:** Direct Solution of the Laplace Equation  
30 min

Iterative Solution of Boundary Value Problems

Time-stepping Methods for Initial Value Problems

Quiz

Programming Assignment: Two-dimensional Diffusion Equation

Farewell

# Mean Value Property of the Laplace Equation

Show that the solution of the discrete Laplace equation at grid point  $(i, j)$  on a uniform grid is just the average value of the solution at the neighboring four grid points,

$(i + 1, j), \quad (i - 1, j), \quad (i, j + 1), \quad (i, j - 1)$

✔ **Completed**      **Go to next item**

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