

## Difficult level of the topic

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Simple One: 1, 2, 4, 6, 11

Moderate one: 3, 6, 7, 8, 10, 13

Difficult one: 9, 12, 14, 15, 16, 17

For simple question, we expect students code it themselves. We can ask general questions like Do you code it by yourself? Possible questions to ask:

Topic 13:

- Q1: Why we need finite volume scheme?
- Q2: From the presentation, both finite element and finite volume method can be formulated in the variational form? What is the main difference between them in the variational form in terms of trial and test space?
- Q3: For the simplest 1D Poisson equations, do you observe any similarity in terms of discrete matrix and right hand side?

Topic 3:

- Q1: What is the main difference between Hermite interpolation and spline interpolation?
- Q2: Why we need spline?
- Q3: In this presentation, you talked about piecewise interpolation? What are the main advantages do you think the piecewise interpolation over the global interpolation?

Topic 15:

- Q1: In general, we could have Dirichlet boundary condition and Neumann boundary condition, what is the main difference between them in the physics sense?
- Q2: Is the matrix SPD (symmetric, positive definite)?
- Q3: Explain the physical meaning of your plot?
- Q4: In general, how can we avoid locking?

Topic 16:

- Q1: What is the main difficulty when we add random?
- Q2: Why we need weak order of convergence?
- Q3: What is the main difference between strong and weak convergence?
- Q4: For the stochastic ODE, do we have any constraint on the time step size? For example, do we need similar conditions for stability for Euler method?

Topic 9:

- Q1: Why we need iterative method to find eigenvalues?
- Q2: What is the main limitation of Jacobi matrix?
- Q3: Do you compare the Jacobi matrix with power method? Which is more efficient for symmetric matrix?

Topic 11:

- Q1: Could you please give an example about stiff problem?
- Q2: Why we need L-stability?
- Q3: What is the main advantage of RKC over other stiff solvers like BDF?
- Q4: Can we apply RKC for general stiff problems?