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## POD 25 : lectures 8-14 review

### lecture Finite Difference Solutions

08

p 101-113

- Center diff. algorithm
- $O(\frac{1}{n^2})$  BC approx
- Neumann stability criteria

### lecture Boundary layer solutions

09

p 114-128

- Morgan's theorem / Affine stretching
- Scaling of BL
- canonical form
- solving ODE as system of 1<sup>st</sup> order
- shooting method

### Lecture Periodic Heating / Penetration Depth

10

p 129-142

- oscillatory forcing problems
- penetration depth from scaling
- solve linear problem via continuation in complex plane

### Lecture Convective Heat Transfer

11

p. 143-158

- Derivation of convective transport Eq'n
- Scaling of convective terms
- $\delta_{eff}$  in direction of conv. is small
- Introduce Nusselt - Graetz problem

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## Lecture Graetz - Nusselt Problem

- 12  
p. 158-180
- Heat transfer coef for wall ht flux prob.
  - transient solution:  $h$  higher at entrance
  - practice w/ asymp sol'n & SL problems

## Lecture Nusselt Number Correlations

- 13  
p. 181-197
- + Ht transf. cor. for pipe flow
  - analogies between energy & mass transp.
  - ht exch analysis for double-pipe ht exch.
  - sizing of a ht. exch
  - overall ht transf. coef.

## Lecture Nusselt Number Cor. for external flows

- 14  
p. 198-213
- Forced conv. cor (Whittaker)
  - Scaling w/  $Re$ ,  $Pr$
  - Free conv. cor. (Churchill)
  - Scaling w/  $Ra$ ,  $Pr$