

# Exercise Numerical Approximation

## 1. Exercise 1D System

### System Analysis

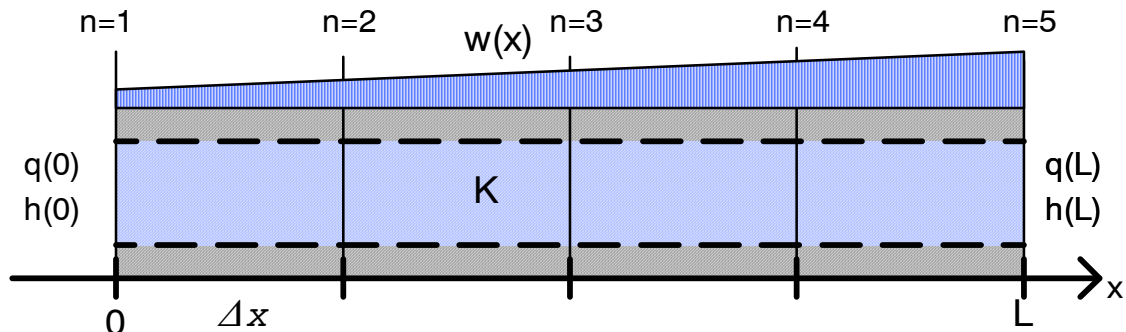


Figure 1: 1D System with 5 nodes

- $L = 4.$  system length
- $K = 3.$  global hydraulic conductivity
- $N = 5$  number of nodes
- $w = w(x)$  external inflow / length
- $q(0), q(L)$  boundary flux
- $h(0), h(L)$  boundary head

Please solve the boundary value problem with

- a)  $w(x) = w_1 x + w_0$   $h(0) = h_0$   $h(L) = h_L$   
 $w_0, w_1, h_0, h_L = \text{constant values}$
- b)  $w(x) = w_1 x + w_0$   $q(0) = q_0$   $h(L) = h_L$   
 $w_0, w_1, q_0, h_L = \text{constant values}$
- c) can you solve the problem with  $w(x)=0$  and the boundary conditions  $q(0) = q_L$   $q(L) = q_L$  ?

Please set up the equation system for FDM with:

- I)  $w_0 = 0$   $w_1 = 0$   
 $h_0 = 12$   $h_L = 18$   
 $h(x = L/2) = ?$
- II)  $w_0 = 2$   $w_1 = 0$   
 $h_0 = 12$   $h_L = 18$   
 $h(x = L/2) = ?$
- III)  $w_0 = 0$   $w_1 = 0$   
 $q_0 = 6$   $h_L = 18$   
 $h(x = L/2) = ?$
- IV)  $w_0 = 2$   $w_1 = 0$   
 $q_0 = 6$   $h_L = 18$   
 $h(x = L/2) = ?$