Quiz 11 (25 points) Name:

Please attach this page to your solutions and put your name on back of last sheet to simplify return. Use additional sheets of paper, if needed.

For the differential equation of C(x,t) given below,

 d2C/dx2 +  dC/dx – k1\*C/(k2+C) = dC/dt where , k1, k2 are constants

1 (15 points) Provide the finite difference equation, i.e. fill in the blanks { }, in the format:

{ } Cm+1p + { } Cmp + { } Cm-1p = Cmp+1

Where Cmp means the value of C(m,p), i.e. C at position m and time p



2. (5 points) Determine the criteria for the stability of the finite difference solution.



1. (5 points) Explain how the numerical shooting method works to solve a 2nd order differential equation for 0<x<L with boundary conditions, e.g. given v’’(x) = …, with boundary conditions v(0)=p and v(L)=W.
2. Decompose into 2 first order differential equations, e.g. u(x)=v’(x) and u’(x)=v’’(x)
3. Guess a value for u(0) and use a predictor-corrector method (e.g. Euler’s, Heun, R-K methods) to solve for u(x) and u’(x). e.g. Euler’s method,x=1: v(1)=v(0)+u(0)\*x and u(1)=u(0)+u’(0)\*x., and so on. (Note that u’(x)=v’’(x) can be calculated for any value of x.)
4. Continue to x=L and determine if solution is the same as the boundary condition. If not, select new u(0) and solve until the boundary condition at L is met satisfactorily.