Upwind

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```python
In [3]: import numpy as np

        def upwind(c):
            dt = 0.04
            dx = 0.05
            nu = c*dt/dx

            # Max values of X and Y are 4
            n = int(10/dt)
            m = int(4/dx)

            X = np.linspace(-2, 2, m)
            T = np.linspace(-5, 5, n)

            U = np.zeros((m, n), dtype=np.float32)  # U at nth iteration
            # U at (n + 1)th iteration, yet to be calculated


            # Intializing U
            # u = 0; for x = 0; y = 0
            # u = x**2 along y = 4; 0< x < 4
            # u = 16*y along x = 4; 0 < y < 4
            # U[0:int(1/dx),0] = 0
            U[0:int(2/dx), 0] = X[0:int(2/dx)]+2
            U[int(2/dx):, 0] = 2 - X[int(2/dx):]

            for i in range(0, n-1):
                for j in range(0, m):
                    U[j, i+1] = U[j,i] - nu*(U[j,i] - U[(j-1+m)%m, i])

            return U

In [ ]:

In [17]: %matplotlib inline

         import matplotlib.pyplot as plt
         U1, U2 = upwind(1), upwind(0.01)
         plt.plot(U1[:, 220]);plt.plot(U2[:, 220])

Out[17]: [<matplotlib.lines.Line2D at 0x7f547358f250>]
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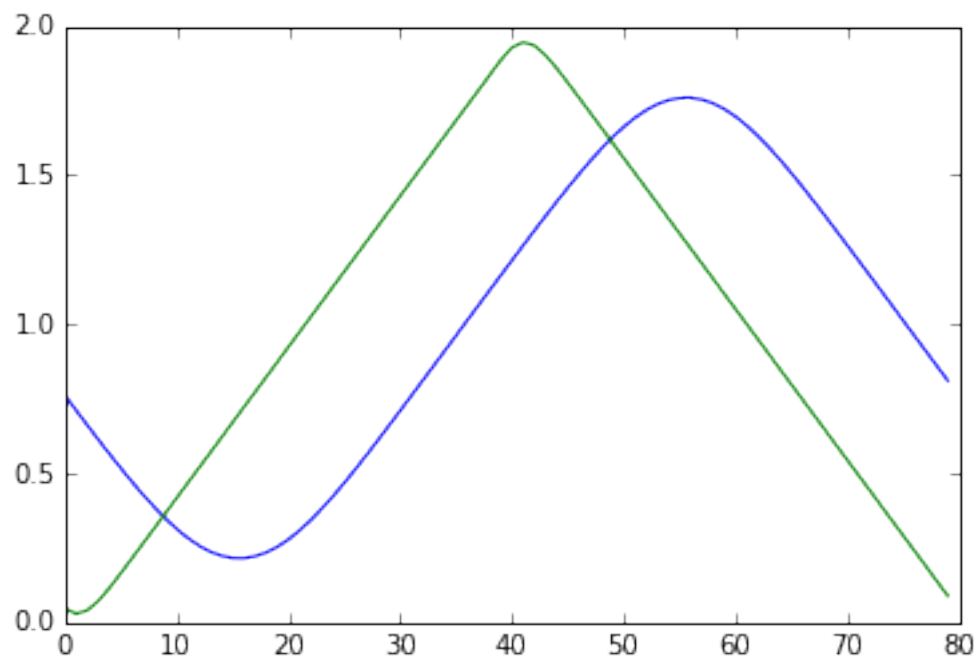
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