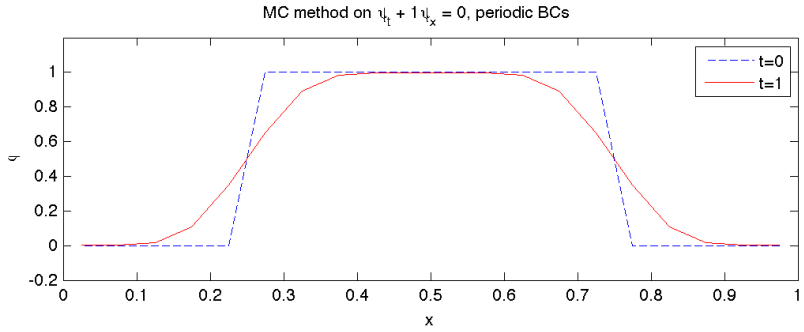
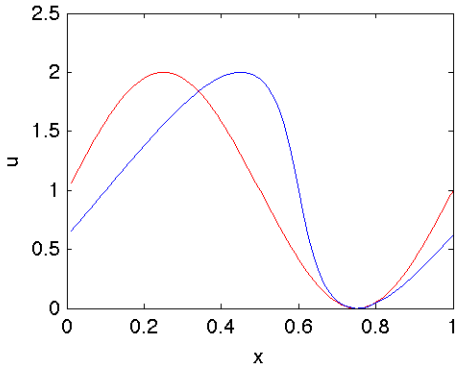
Lecture 16 figures (plots and scripts are on class web page):

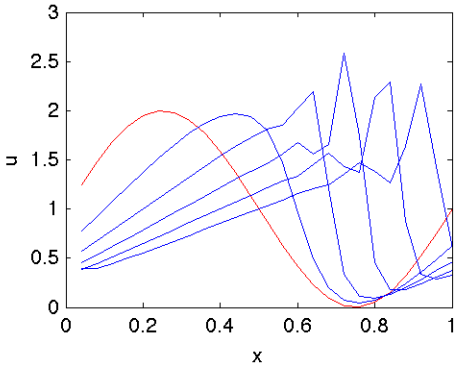
(1) From advect_MC.m, which implements MC-limiter on the advection equation on the periodic domain $0 < x < 1$, using square wave initial condition and Courant number 0.8. Numerical solution (red) does not create spurious oscillations and compares fairly well with exact solution (blue) despite coarse grid spacing $\Delta x = 0.05$.



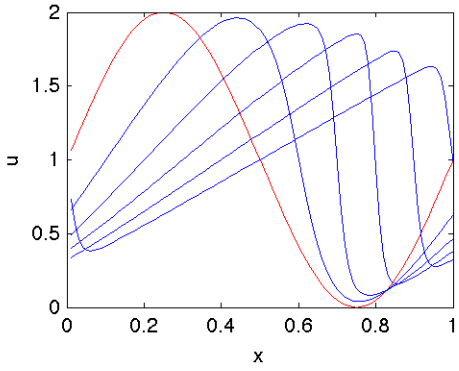
(2) From burgers.m, which implements centered finite-difference space differencing and RK4 time differencing on $u_t + uu_x = au_{xx}$ on the periodic domain $0 < x < 1$ with periodic BCs and $u(x, 0) = 1 + \sin(2\pi x)$. Red: IC, Blue: $u(x, T)$ at time T.



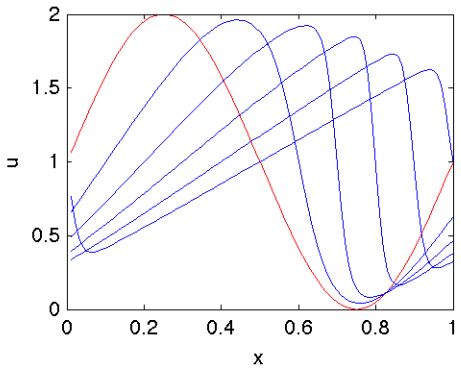
$a = 0$, $T = 0.1$, $\Delta x = 0.01$
Inviscid, prior to shock onset



$a = 0.01$, $T = 0.5$, $\Delta x = 0.04$
Under-resolved shock→oscillations



$a = 0.01$, $T = 0.5$, $\Delta x = 0.01$, $\Delta t = 0.005$
Adequately resolved shock



$a = 0.01$, $T = 0.5$, $\Delta x = 0.01$, $\Delta t = 0.01$
burgers_split.m with C-N on au_{xx}