

I worked with no one on this worksheet. It took about one hour.

Advection Equation

I modified `upwind.py` from WS11 to have variable velocity based on the value of the function; i.e. Burger's equation rather than the advection equation. When the initial data is a sine wave, a beautiful shock forms by $t = 150$ as the two peaks run into each other, as shown in the figures below.

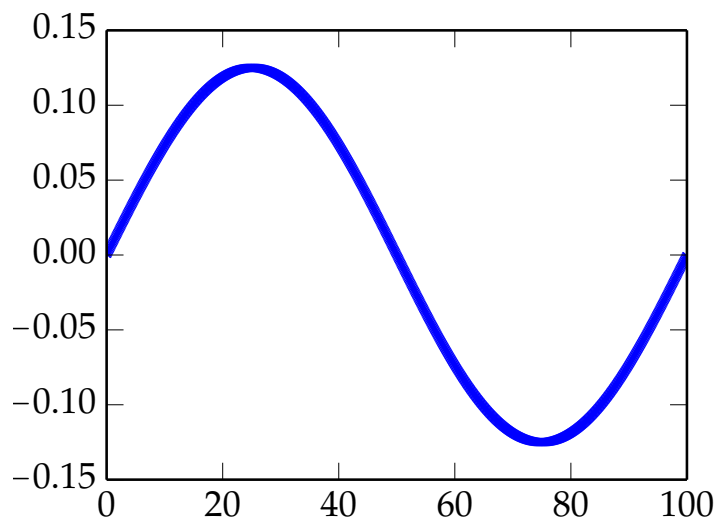


Figure 1: Initial data.

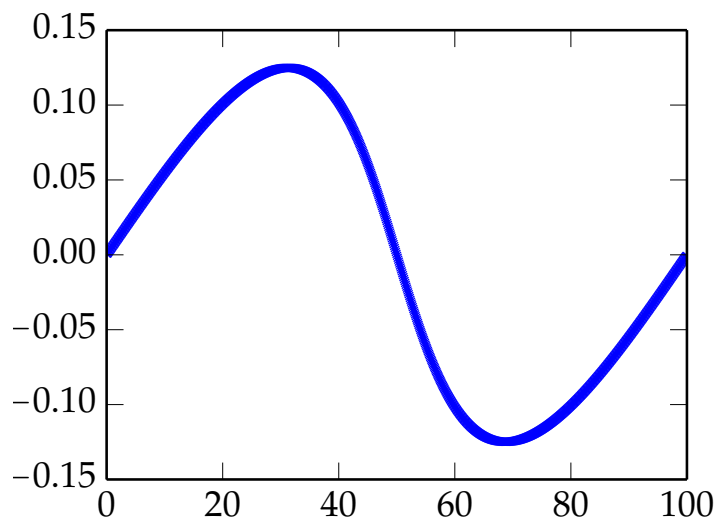


Figure 2: Solution to Burger's equation at time $t = 50$.

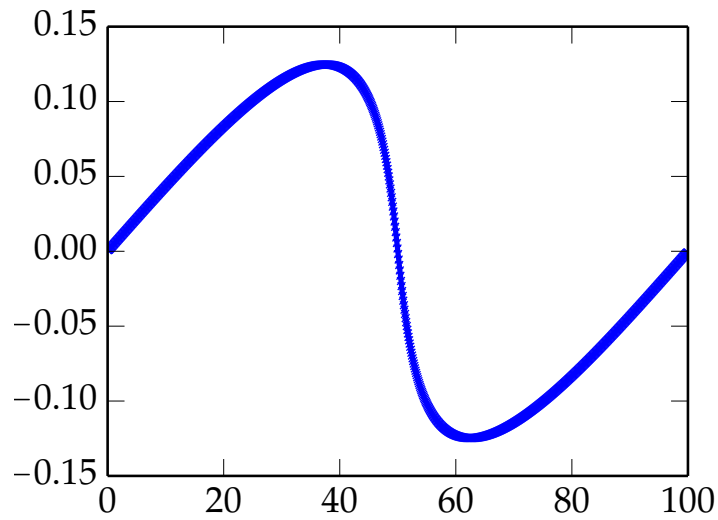


Figure 3: Solution to Burger's equation at time $t = 100$.

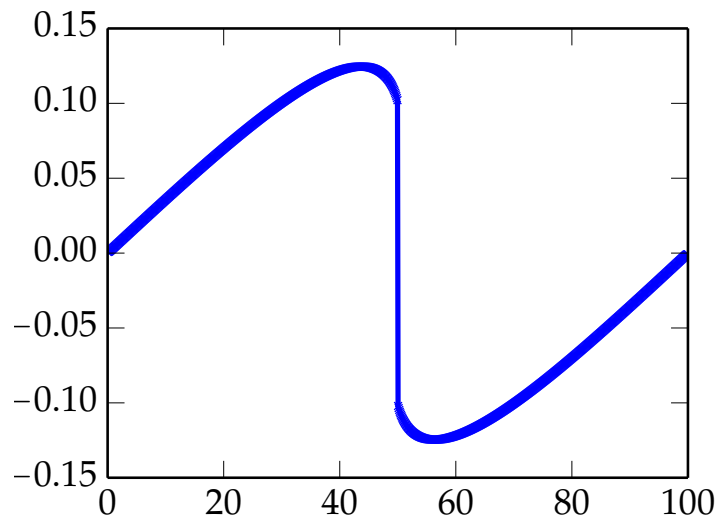


Figure 4: Solution to Burger's equation at time $t = 150$. At this point, the shock discontinuity is beginning to form.

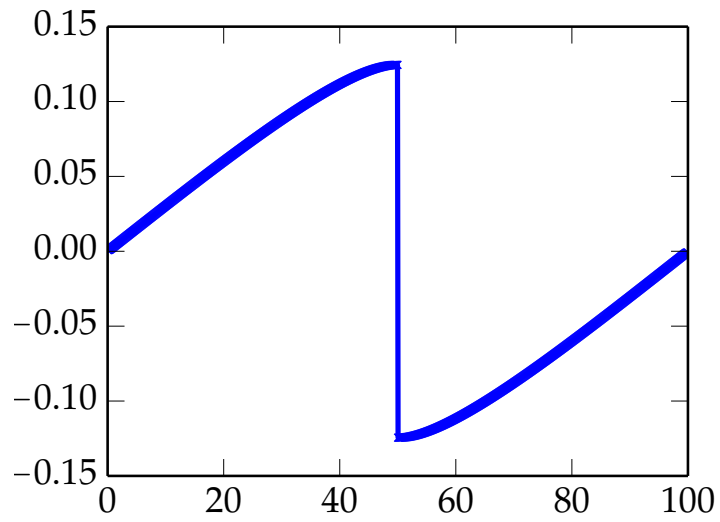


Figure 5: Solution to Burger's equation at time $t = 200$.