AER 336S: Problem 5

Please use fortran or C for this assignment. As always, submit a thoroughly commented source code. You may use the plotting package of your choice (matlab, if you wish) and must put your name on the figures.

Solve the following equation numerically on the domain $0 \leq x \leq 1$ with boundary conditions $u(0) = 0$, $u(1) = 1$ and initial condition $u(x) = x$:

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2} - 6x$$

Use second-order centered differences on a grid with 40 cells, i.e., 39 interior nodes. Use the fourth-order Runge-Kutta method developed above to integrate in time. Choose a suitable value of Δt. Plot the solution at regular time intervals as it approaches a steady state.