By 23th of March:

(1) Use any programming language, the 2th order central difference approximation for the first-order derivative

$$\frac{df}{dx} \approx \frac{1}{2\Delta x}(f_{i+1} - f_{i-1}),$$

and Euler-type time advancement scheme

$$\frac{df}{dt} \approx \frac{1}{\Delta t}(f^{t+1} - f^{t}),$$

to solve the one-dimensional continuity equation

$$\frac{\partial \rho}{\partial t} + \frac{\partial(\rho v_x)}{\partial x} = 0.$$

Use periodic boundary conditions for the spatial derivative calculation: if f_i is defined on an equidistant grid $i=0..n-1$, periodic boundary condition means that the values of the derivative at $i=0$ and $i=n-1$ are calculated from f_1 and f_{n-1}, and from f_0 and f_{n-2}, respectively.

Use constant $v_x=1$ and a narrow (to keep zero values at the boundaries) Gaussian as the initial density profile $\rho(x)$.

If you do everything right, your program will nicely crash after a few time steps due to the numerical instability of the central difference scheme.