

Instructions: Do your own work. You may consult your class notes and the course text. Do not consult other sources. Do not discuss generalities or specifics of the exam with anyone except me.

Turn in a complete and concise write up of your work. Show enough detail so that a peer could follow your work (both computations and reasoning). All plots should be carefully drawn either by hand or printed from technology. If you want to include a visualization that cannot be printed (such as an animation), include it as an attachment in an email with "Math 302 Exam 3" as the subject line.

The exam is due at the beginning of class on Monday, October 10.

Consider stuff with density u flowing in one dimension due to both advection and diffusion. Model this with the fundamental conservation law in one dimension with $\phi = cu - ku_x$ and no creation or destruction processes. Assume the flow parameters c and k are uniform and constant. Take the spatial domain to be $0 \leq x \leq L$ and assume that the density at each end is held constant.

Set up and solve the steady-state problem for this scenario. Provide understanding and interpretation of the solution(s) with plots and/or a physical description. As part of understanding and interpreting a solution, explore the dependence on the boundary conditions and on the flow parameters.