

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 1" as the subject line.

The exam is due at the beginning of class on Monday, September 12.

The heat equation (in cartesian coordinates) is $u_t = ku_{xx}$ for a constant $k > 0$. Take the domain to be $-\infty < x < \infty, t > 0$. Interpret t as representing time and x as representing a spatial coordinate. The heat equation relates the first time derivative to the second spatial derivative. We can think of u_t as the rate of change in u with respect to t and u_{xx} as the concavity of u with respect to x . The heat equation is then a relation between the time rate of change of u and the spatial concavity of u . Your goal for this exam is to describe general properties of heat equation solutions by considering this view of the heat equation. Your response should include both general descriptions of properties that are true for all heat equation solutions and an illustration of each property using the specific solution given in Section 1.1 #1.