

Math 54 Discussion Section Problems

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You should work on the following problems in groups of 3 or 4. Try to get through as many as you can, but you aren't expected to finish everything. In fact, the answers are largely unimportant; making sure **everyone** in your group knows **how** to solve all the problems is what really matters.

1. Find a formal solution to the heat equation

$$\begin{aligned}u_t &= u_{xx} + e^{-x} \\u(0, t) = u(\pi, t) &= 0 \\u(x, 0) &= \sin 2x\end{aligned}$$

2. Consider the PDE $u_t + tu = u_{xx}$ with boundary conditions $u_x(0, t) = u_x(\pi, t) = 0$.
 - (a) Use the method of separation of variables to find all solutions of the form $u(x, t) = X(x)T(t)$.
 - (b) Find a solution satisfying the initial condition $u(x, 0) = \sin^2 x$