Homework - MTH 357

Instructions: Homework is to be neat and organized. **If it's messy it's wrong.** Answers without the necessary supporting work are worth 0. You may discuss problems with others but must always produce your own work and write your own solutions. Copying someone else's homework is considered cheating.

HW9, due 12/7

1. Find the Fourier integral representation of the solution, $u(x,t)$, to the heat equation on a metal bar of infinite length in both directions, with arbitrary c and $u(x,0) = f(x) = e^{-|x|}$. Simplify the inner integral
2. Use Mathematica to plot your solution from #1 (with $c = 1$), plotting $u(x,0)$, $u(x,1)$, and $u(x,2)$ on the same graph.
3. Find the Fourier integral representation of the solution, $u(x,t)$, to the heat equation on a half-infinite metal bar of, with arbitrary c, $u(0,t) = 0$, and $u(x,0) = f(x) = Boole[0 < x < 2](1 - (x-1)^2)$. Simplify the inner integral
4. Use Mathematica to plot your solution from #3 (with $c = 1$), plotting $u(x,0)$ and $u(x,0.5)$ on the same graph.
   (a) As usual, you may use Mathematica for integrals as long as you turn in what you're using.
   (b) If you don't simplify the inner integrals and use them for parts 2 and 4, Mathematica will likely take too long when creating your plots.
   (c) Even with the simplified inner integrals, the plots can take 10-30 seconds to complete.
   (d) Feel free to borrow syntax from 12.7.nb, which is posted on Canvas.