Math 4354
Written Assignment # 6
Due: November 19, 2018

Use Fourier Transforms to solve the heat or wave equations on an infinite spatial domain. Please show your work. Answers without the computations will not be accepted.

1. Solve the heat equation on $-\infty < x < \infty$.

   PDE $u_t = ku_{xx},\ -\infty < x < \infty,\ 0 < t < \infty$
   IC $u(x,0) = 2e^{-|x|},\ -\infty < x < \infty.$

2. Solve the heat equation on $0 < x < \infty$.

   PDE $u_t = ku_{xx},\ 0 < x < \infty,\ 0 < t < \infty$
   BC $u(0,t) = 0,\ 0 < t < \infty.$
   IC $u(x,0) = e^{-2x},\ 0 < x < \infty.$

3. Solve the wave equation on $0 < x < \infty$.

   PDE $u_{tt} = u_{xx},\ 0 < x < \infty,\ 0 < t < \infty$
   BC $\left.\dfrac{\partial u}{\partial x}\right|_{x=0} = 0,\ 0 < t < \infty$
   IC $u(x,0) = 3e^{-x},\ \left.\dfrac{\partial u}{\partial t}\right|_{t=0} = 0,\ 0 < x < \infty.$

4. Solve the wave equation on $0 < x < \infty$.

   PDE $u_{tt} = u_{xx},\ 0 < x < \infty,\ 0 < t < \infty$
   BC $u(0,t) = 0,\ 0 < t < \infty$
   IC $u(x,0) = 5xe^{-x},\ \left.\dfrac{\partial u}{\partial t}\right|_{t=0} = 0,\ 0 < x < \infty.$