## Math 21b, April 25: Some more PDEs and Review

1. Find the solution $f(x, t)$ to the inhomogeneous partial differential equation

$$
f_{t}=-f_{x x}+\sin (7 t)
$$

given the initial condition $f(x, 0)=x$. Use the following steps:

- Find the general form of the solution to the homogeneous equation using Fourier series in $x$.
- Find a particular solution to the above inhomogeneous equation using the cookbook method. Trick: find a solution to $f_{t}=\sin (7 t)$, and the just use this particular solution!
- Add these two to get the general form of the solution for the inhomogeneous equation.
- Solve for the initial Fourier coefficients by finding a sine series for $f(x, 0)=x$.

2. (HW31 \#4) A laundry line is excited by the wind. It satisfies the differential equation

$$
u_{t t}=u_{x x}+\cos (t)+\cos (3 t)
$$

with initial conditions $u(x, 0)=4 \sin (5 x)+10 \sin (6 x)$ and $u_{t}(x, 0)=0$. Find the function $u(x, t)$ which satisfies the differential equation.

