

math 21A - Sug Woo Shin - PDE extra handout

Some famous PDE's:

1) Laplace equation $f_{tt} + f_{xx} = 0$.

2) Wave equation $f_{tt} = f_{xx}$.

3) Heat equation $f_t = f_{xx}$.

(As for the equations 2) and 3), t is time and x is position in usual applications.)

Problem 1. Match the following functions to the equation(s) that they satisfy.

a) $f(t, x) = e^{2x} \sin(2t)$.

b) $f(t, x) = \sin(t - 1) \cos(x + 1)$.

c) $f(t, x) = \sin(2t + x) + \sin(2t - x)$.

d) $f(t, x) = t^4 - 6t^2x^2 + x^4$.

e) $f(t, x) = e^{t+x}$.

f) $f(t, x) = 3t + tx - 5x$

Problem 2. Suppose that $f(t, x) = \sin(ax + bt)$ is a solution of 2). What conditions are satisfied by a and b ?

Problem 3. For what values of a and b is the function $f(t, x) = e^{at} \cos(bx)$ a solution of 1)?

Problem 4. The function $f(t, x) = e^{at} \cos(3x) - 5x + 2$ is a solution of 3). Find a .