

**Homework 3 (MATH 5400-01)****Name (Print):****Due date: Friday, Sept. 28, 2012**

1. a) Find the Fourier series  $S(x)$  of  $f(x) = \exp(x)$  for  $-2 \leq x < 2$ .  
b) Compare the  $n^{\text{th}}$  partial sum  $S_n(x)$  of the Fourier series with  $f(x) = \exp(x)$  in a plot.  
Use  $n = 5, 10, 100$ .  
c) Determine the exact value of the Fourier series  $S(x)$  at  $x = 2$ .

2. Solve the following problem by using the Fourier transform:

$$u_{tt} = c^2 u_{xx}, \quad -\infty < x < \infty, t > 0$$

$$u(x,0) = f(x), \quad u_t(x,0) = 0, \quad -\infty < x < \infty$$

Here,  $c$  is a constant, and  $f(x)$  is any function. Hint: After calculating the Fourier transform use Euler's formula  $\cos z = (e^{iz} + e^{-iz}) / 2$  to find  $u(x, t)$ .