LUND UNIVERSITY

Centre for Mathematical Sciences
Mathematics, Faculty of Science

Linear Analysis
Saturday April 22 2017
Duration: 08.00–13.00

Answers

1. **a)** Divergent.
b) Convergent.
c) Convergent.

2. The solution is

$$u(x,t) = \frac{1}{2}(\cos 6t \cos 6x + \cos 2t \cos 2x).$$

3. **a)** The Fourier coefficients of u are

$$c_0 = \frac{\pi}{4}, \quad c_n = \frac{i}{2n}, \quad n \quad \text{even} \neq 0, \qquad c_n = -\big(\frac{i}{2n} + \frac{1}{\pi n^2}\big), \quad n \quad \text{odd}.$$

b) The sum of the Fourier series for $x = \pi$ is $\pi/2$.
c)

$$\sum_{n=0}^{\infty} \frac{1}{(2n+1)^2} = \frac{\pi^2}{8}.$$

4. The solution is

$$u(x) = x - \frac{5}{3}x^3.$$