

## Dugga

### Fourieranalys/Fourier Metoder, lp1, 2018

---

Skriv ditt namn och personnummer - tydligt!

---

1. (1P) Define the Fourier coefficients  $c_n$  on  $[-\pi, \pi]$  for a function  $f(x)$ .

2. (1P) Compute the Fourier series for  $f(x) = e^x$  on  $[-\pi, \pi]$ . Use this to evaluate

$$\sum_{n \geq 1} \frac{1}{1 + n^2}.$$

3. (1P) Define the scalar product of two functions  $f(x)$  and  $g(x)$  on the interval  $[-\pi, \pi]$ .

4. (1P) State Bessel's inequality.

5. (1P) Solve:

$$\begin{aligned} u(x, 0) &= \begin{cases} x + \pi, & -\pi \leq x \leq 0 \\ \pi - x, & 0 \leq x \leq \pi \end{cases} \\ u_t(x, 0) &= 0 \\ u(-\pi) &= u(\pi) = 0 \\ u_t(x, t) - u_{xx}(x, t) &= 0 \quad x \in [-\pi, \pi], \quad t > 0. \end{aligned}$$