

Quiz 5

Rules: 60 minutes. 1 formula sheet allowed. Calculator forbidden.

Question 1.

Let $t \in \mathbf{R}$ be a parameter. Calculate $\det \begin{pmatrix} 2 & -1 & 1 & 1 \\ t & -1 & 1 & 1 \\ 1 & 1 & 1 & t \\ t & -1 & 1 & -1 \end{pmatrix}$.

For which parameters t is this matrix invertible?

Question 2.

Let $f(x, y) = \begin{pmatrix} y^2 \\ x^2 + y \end{pmatrix}$, let $g(u, v) = u^2v^2$.

Calculate $f'(x, y)$, $g'(u, v)$.

Use the chain rule to calculate $(g \circ f)'(x, y)$.

Check the result by a direct calculation (first compose, then derive).

Question 3.

Let $f(x) = xe^{2x}$ for $x \in [0, 2\pi)$, continued 2π -periodically to \mathbf{R} .

Calculate the complex Fourier series of f .

Calculate the real Fourier series of f .

What is the value of the Fourier series in $x = 0$?