Assignment 1, Due September 22

Numbered exercises refer to Bhatia.

1) Let \( n \) be a positive integer and \( \omega = e^{2\pi i/n} \).
Let \( W_n \) be the \( n \times n \) matrix with \( (i, j) \)-entry \( \omega^{(i-1)(j-1)}, 1 \leq i, j \leq n \). Write out \( W_1, W_2, \) and \( W_3 \). Show that \( W_n \) is invertible and find \( W_n^{-1} \).

2) 1.1.1
3) 1.1.3
4) 1.2.1
5) 1.3.2

Math 421
Fourier Series
Autumn 2006


Topics Covered:

- Ch. 1, Fourier series and the heat equation
- Ch. 2, Convergence of Fourier series
- Ch. 3, Sine and cosine series, arbitrary periods, \( \sin(x)/x \), Gibbs’s phenomenon
- Ch. 4, Convergence in \( L^2 \) and \( L^1 \)
- Ch. 5, Applications: ergodic theorem, vibrating string
  - Fourier transform
  - Discrete Fourier transform (time permitting)
  - Wavelets (time permitting)

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  - Tuesday: 1:30 - 2:30
  - Wednesday: 2:30 - 3:30

Grading Scheme:
- five assignments 40%
- midterm examination 30%
- final examination 30%.