

Homework 10
due Thurs., May 7

1. Suppose $f(x) = (x - 1)^n g(x)$ with g a polynomial and define $h(\xi) = f(e^{i\xi})$. Prove the following two statements (e.g. by induction on n):

$$f^{(k)}(1) = \begin{cases} 0 & 0 \leq k < n \\ n! g(1) & k = n. \end{cases}, \quad h^{(k)}(0) = i^k f^{(k)}(1), \quad 0 \leq k \leq n.$$

2. Compute the Fourier transform $\hat{f}(\xi, \eta)$ of $f(x, y) = e^{-52x^2 - 72xy - 73y^2}$. You may use the 1d formula $g(x) = e^{-\frac{x^2}{2s}} \Rightarrow \hat{g}(\xi) = \sqrt{s} e^{-\frac{s\xi^2}{2}}$.
3. problem 6 on page 240.
4. problem 7 on page 240.