

### MATE 6677 assignment 3

10. Compute the Fourier transform of  $\chi_U$ , characteristic function of  $U = [0, 1] \times \dots \times [0, 1]$ , unit cube in  $\mathbb{R}^n$ .
11. Explain the detail of the last step in the proof of theorem (0.27), the Fourier inversion theorem.
12. If  $f(x) = \exp(-\alpha^2|x|^2)$  and  $g(x) = \exp(-\beta^2|x|^2)$ , functions defined on  $\mathbb{R}^n$ , compute  $f * g$ .
13. State, without proof, the theorem of partitions of unity, and show how to use it to prove that if a distribution is zero on each set of a collection of open sets, then it is also zero on their union.

Marks:  $6 + 6 + 9 + 9 = 30$ .