

5. (25 pts.) For  $a \in \mathbb{R}$ , let  $f_a$  be the function on  $\mathbb{R}$  defined by  $f_a(x) := e^{iax}$ .

(a) Show that  $f_a$  is a tempered distribution on  $\mathbb{R}$ .

(b) Find the Fourier transform of  $f_a$ .

6. (25 pts.) Let  $\mathcal{C}$  be a collection of open balls in  $\mathbb{R}^n$ , and let  $U = \bigcup_{B \in \mathcal{C}} B$ . Prove that if  $c < m(U)$ , then there exist disjoint balls  $B_1, \dots, B_k$  in  $\mathcal{C}$  such that  $\sum_1^k m(B_k) > 3^{-n}c$ . [This statement is proved in Folland, but you are being asked to give a proof here.]