1. Find the Lebesgue set $L_f$, if:
   (a) $f : \mathbb{R}^n \to \mathbb{C}$ is continuous;
   (b) $f = \chi_E, E \in \mathcal{B}_{\mathbb{R}^n}$ (Lebesgue) null: $m(E) = 0$;
   (c) $f(x) = |x|$ on $\mathbb{R}$.

2. (a) If $F : \mathbb{R} \to \mathbb{C} \in \text{NBV}$, show that there is a (Lebesgue) null Borel set $N \subset \mathbb{R}$ such that if $[a, b] \cap N = \emptyset$, then
   \[ F(b) - F(a) = \int_a^b F'(t)dt. \]
   (b) Show that if $F : \mathbb{R} \to \mathbb{R}$ is increasing, and $-\infty < a < b < \infty$,
   \[ F(b) - F(a) \geq \int_a^b F'(t)dt. \]

3. For the function $F(x) = |x|$ on $[-1, 1]$:
   (a) show directly from the definition that $F$ is absolutely continuous on $[-1, 1]$;
   (b) show directly that $F$ satisfies the FTC: $F(x) - F(-1) = \int_{-1}^x F'(t)dt$.

4. On $(-1, 1), F_1(x) = x^2 \sin \left(\frac{1}{x^2}\right), F_2(x) = x^2 \sin \left(\frac{1}{x^2}\right), F_3(x) = x^2 \sin \left(\frac{1}{x^3}\right) (F_j(0) = 0)$:
   (a) Show that each $F_j$ is (everywhere) differentiable.
   (b) Show that $F_1$ is absolutely continuous (hence also BV). Hint: show $|F'_1|$ bounded.
   (c) Show $F_2$ is not BV (hence also not AC). Hint: consider $F_2$ at $x_n = (\pi/2 + n\pi)^{-1/2}$.
   (d) Show $F_3$ is absolutely continuous.