Real Analysis; do two of the following (you may use the earlier ones for the later parts.) [μ = Lebesque Meas on $\mathbb{R}^1$.]

(i) Show that if $A = [a, b]$, then

$$\lim_{n \to +\infty} \int_A \sin nx \, d\mu(x) = 0$$

(ii) Show that if $A \subset [-m, m]$ is measurable then,

$$\lim_{n \to +\infty} \int_A \sin nx \, d\mu(x) = 0.$$

(iii) Show that if $f(x)$ is integrable then $\lim_{n \to +\infty} \int f(x) \sin nx \, d\mu(x) = 0.$