11, 9, 16 part a.

$$\mathcal{F}(f(x+a)) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} f(x+a) e^{-iwx} \, dx$$

let $v = x + a$

$$= \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} f(v) e^{-iw(v-a)} \, dv$$

$$= \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} f(v) e^{-iwv} e^{iwa} \, dv$$

$$= e^{iwa} \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} f(v) e^{-iwv} \, dv$$

$$= e^{iwa} \mathcal{F}(f(x))$$

part c

$$\mathcal{F}^{-1}(F(w+a)) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} F(w+a) e^{iwx} \, dw$$

$v = w + a$

$$= \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} F(v) e^{i(v-a)x} \, dv$$

$$= \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} F(v) e^{ivx} e^{-iax} \, dv$$

$$= e^{-iax} \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} F(v) e^{ivx} \, dv = e^{-iax} \mathcal{F}^{-1}(F(w))$$