5.

a. $F(iw) = \dfrac{1}{iw+3}$

$F(iw) = \dfrac{1}{iw-(-3)}$

$f(t) = e^{-3t} \cdot u(t)$

b. $F(iw) = -i\pi\delta(w-2\pi) + i\pi\delta(w+2\pi) + 1$

$F(iw) = i\pi\left[\delta(w+2\pi) - \delta(w-2\pi)\right] + 1$

$f(t) = \sin 2\pi t + \delta(t)$

c. $F(iw) = (2+e^{3iw})\pi\delta(w) - \dfrac{i(1+e^{3iw})}{w}$

$= 2\pi\delta(w) + e^{3iw}\pi\delta(w) - \dfrac{1}{w} - \dfrac{i}{w}e^{3iw}$

$= 2\pi\delta(w) + e^{3iw}\cdot\frac{1}{2}\cdot 2\pi\delta(w) - \dfrac{i^2}{iw} - \dfrac{i^2}{iw}\cdot e^{3iw}$

$= 2\pi\delta(w) + \frac{1}{2}e^{3iw}\cdot 2\pi\delta(w) - i^2\dfrac{1}{iw-0} - i^2 e^{3iw}\cdot\dfrac{1}{iw-0}$

$= 1 + \frac{1}{2}e^{-3t}\cdot 1 - i^2\cdot e^{0t} - i^2 e^{-3t}\cdot e^{0t}$

$= 1 + \frac{1}{2}e^{-3t} - (-1) - (-1)e^{-3t}$

$= 1 + \frac{1}{2}e^{-3t} + 1 + e^{3t}$

$= 2 + \frac{3}{2}e^{-3t}$