1、解：$f(t) \Leftrightarrow F(\omega)$

$$f(t) = e^{-at},\ a>0,\ t>0$$

$$F(\omega) = \int_0^{+\infty} e^{-at} e^{-j\omega t} dt$$

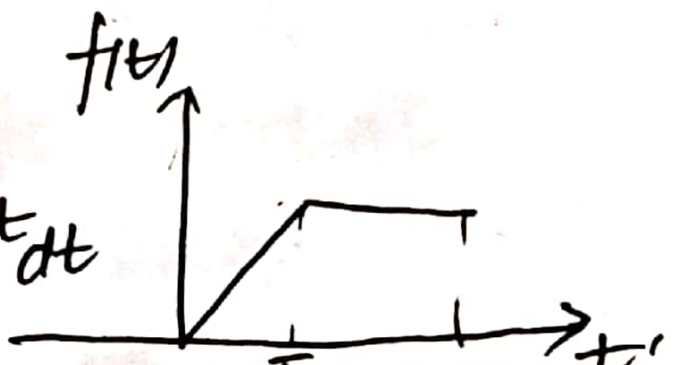
$$= \int_0^{+\infty} e^{-(j\omega+a)t} dt$$

$$= -\frac{1}{a+j\omega} e^{-(j\omega+a)t}\Big|_0^{+\infty}$$

$$= \frac{1}{a+j\omega}$$

$$\therefore F(\omega) = \frac{1}{a+j\omega},\ a>0.$$

2、解：$f(t) \Leftrightarrow F(\omega)$



$$F(\omega) = \int_0^{\tau} t e^{-j\omega t} dt + \tau\int_{\tau}^{2\tau} e^{-j\omega t} dt$$

$$= -\frac{1}{j\omega}\left[te^{-j\omega t}\Big|_0^{\tau} - \int_0^{\tau} e^{-j\omega t} dt\right] + \tau\int_{\tau}^{2\tau} e^{-j\omega t} dt$$

$$= -\frac{1}{j\omega}\tau e^{-j\omega\tau} + \frac{1}{\omega^2} e^{-j\omega\tau} - \frac{1}{\omega^2} + \frac{\tau}{-j\omega} e^{-j\omega t}\Big|_{\tau}^{2\tau}$$

$$= -\frac{\tau}{j\omega} e^{-j\omega\tau} + \frac{1}{\omega^2} e^{-j\omega\tau} - \frac{\tau}{j\omega} e^{-2j\omega\tau} + \frac{\tau}{j\omega} e^{-j\omega\tau} - \frac{1}{\omega^2}$$

$$= \frac{1}{\omega^2} e^{-j\omega\tau} - \frac{\tau}{j\omega} e^{-2j\omega\tau} - \frac{1}{\omega^2}$$

$$\therefore F(\omega) = \frac{1}{\omega^2} e^{-j\omega\tau} - \frac{\tau}{j\omega} e^{-2j\omega\tau} - \frac{1}{\omega^2}$$