## Exercise 6.3

L **Answer (b).**

We are asked to find the Fourier transform $X$ of

$$x(t) = e^{-j5t}\underbrace{u(t+2)}_{v(t)}.$$

Defining the function

$$v(t) = u(t+2), \qquad 1$$

we have that

$$x(t) = e^{-j5t}v(t). \qquad 2$$

Let $V$ and $U$ denote the Fourier transforms of $v$ and $u$, respectively. Taking the Fourier transforms of the preceding equations for $x$ and $v$ and well as the Fourier transform of $u$, we obtain

$$\begin{aligned} 3 \qquad X(\omega) &= V(\omega+5), && \text{FT of 2 (modulation)} \\ 4 \qquad V(\omega) &= e^{j2\omega}U(\omega), \quad \text{and} && \text{FT of 1 (time shift)} \\ 5 \qquad U(\omega) &= \pi\delta(\omega) + \frac{1}{j\omega}. && \text{FT of u from table} \end{aligned}$$

Combining the above results, we have

$$\begin{aligned} X(\omega) &= V(\omega+5) && 3 \quad \text{substitute 4 for V} \\ &= e^{j2(\omega+5)}U(\omega+5) && \text{substitute 5 for U} \\ &= e^{j2(\omega+5)}\left[\pi\delta(\omega+5) + \frac{1}{j(\omega+5)}\right] && \text{multiply} \\ &= \pi e^{j2(\omega+5)}\delta(\omega+5) + \frac{e^{j2(\omega+5)}}{j(\omega+5)} && \text{equivalence property} \\ &= \pi\delta(\omega+5) + \frac{e^{j2(\omega+5)}}{j(\omega+5)}. \end{aligned}$$