2A **L** **3.20** Fully simplify each of the expressions below.

(a) $\int_{-\infty}^{\infty} \sin\left(2t + \frac{\pi}{4}\right) \delta(t)dt$;

(b) $\int_{-\infty}^{t} \cos(\tau)\delta(\tau + \pi)d\tau$;

(c) $\int_{-\infty}^{\infty} x(t)\delta(at - b)dt$, where a and b are real constants and $a \neq 0$;

(d) $\int_{0}^{2} e^{j2t}\delta(t - 1)dt$;

(e) $\int_{-\infty}^{t} \delta(\tau)d\tau$;

(f) $\int_{0}^{\infty} \tau^2 \cos(\tau)\delta(\tau + 42)d\tau$;

(g) $\int_{t+1}^{\infty} (\tau^2 + 1)\delta(\tau - 3)d\tau$;

(h) $\frac{1}{9}\int_{-\infty}^{\infty} (\tau + 6)^2 \delta(1 - \tau/3)d\tau$; and

(i) $\int_{t-2}^{t-1} (\tau - 1)^2 \delta(\tau - 3)d\tau$.