

HW #4 Solutions

(1) b. $f(t) = 5 t e^{-2t} \cos(t) u(t)$
 $= 5 \underbrace{(t e^{-2t} u(t))}_{\text{table}} \times \underbrace{\cos(t)}_{\text{modulation (last item on table)}}$
 $\xrightarrow{\mathcal{F}} \left(\frac{5}{j\Omega + 2} \right)^2 \text{ modulated by } \Omega_0 = 1$
 $= \frac{5}{2} \left[\left(\frac{1}{j(\Omega - 1) + 2} \right)^2 + \left(\frac{1}{j(\Omega + 1) + 2} \right)^2 \right]$

(1) c. $f(t) = \cos(t - 2)$ *table + time delay by 2*
 $\xrightarrow{\mathcal{F}} \pi \left[\delta(\Omega - 1) + \delta(\Omega + 1) \right] e^{-j2\Omega}$

(2) a. $F(\Omega) = \frac{\sin(2\Omega)}{\Omega} \rightarrow \text{directly from table with } \tau = 2$
 $\xrightarrow{\mathcal{F}^{-1}} \frac{1}{2} \left[u(t + 2) - u(t - 2) \right]$

(2) d. $F(\Omega) = e^{-j\Omega + 3} = \underbrace{e^3}_{\text{constant}} \times \underbrace{e^{-j\Omega}}_{\text{table}}$
 $\xrightarrow{\mathcal{F}^{-1}} e^3 \delta(t - 1)$