Prelab 5 EE235 Cynthia Li

Q1. $d_0(t) = \sin(2\pi(941)t) + \sin(2\pi(1336)t)$

$= \frac{1}{2j}(e^{941\omega_0 t} - e^{-941\omega_0 t}) + \frac{1}{2j}(e^{1336\omega_0 t} - e^{-1336\omega_0 t})$

$= \frac{1}{2j}e^{941\omega_0 t} - \frac{1}{2j}e^{-941\omega_0 t} + \frac{1}{2j}e^{1336\omega_0 t} - \frac{1}{2j}e^{-1336\omega_0 t}$

a). For $k = 941, -941, 1336, -1336$, coefficient is non-zero.

b). For $\sin(2\pi(941)t)$, $f = \frac{\omega}{2\pi} = 941\ Hz$

For $\sin(2\pi(1336)t)$, $f = \frac{\omega}{2\pi} = 1336\ Hz$

c) $\frac{8000}{4096} = 1.953125$

$\rightarrow \frac{941}{1.953125} = 481.792$

$\frac{1336}{1.953125} = 684.032$

$\because$ k is integer

$\therefore 481.792 \approx 482\ Hz$

$684.032 \approx 684\ Hz$

Q2. tone_freqs = np.array([[941, 1336], [697, 1209], [697, 1336], [697, 1477], [770, 1209], [770, 1336], [770, 1477], [852, 1209], [852, 1336], [852, 1477]])