Problem 1.1

\[ x[n] = -\sin\left(\frac{3\pi n}{5}\right) + 3\cos\left(\frac{2\pi n}{5}\right) \]

Problem 1.2

\[ X(j\Omega) = -j\pi\delta(\Omega - 14000\pi) + j\pi\delta(\Omega + 14000\pi) + 3\pi\delta(\Omega - 16000\pi) + 3\pi\delta(\Omega + 16000\pi) \]
Sketch should show delta functions at ±14000π and ±16000π with areas of −jπ, jπ, 3π, and 3π.

\[ X(e^{j\omega}) = j\pi\delta\left(\omega - \frac{3\pi}{5}\right) - j\pi\delta\left(\omega + \frac{3\pi}{5}\right) + 3\pi\delta\left(\omega - \frac{2\pi}{5}\right) + 3\pi\delta\left(\omega + \frac{2\pi}{5}\right) \]
Sketch should show delta functions at ±3π/5 and ±2π/5 with areas of −jπ, jπ, 3π, and 3π.

Problem 1.3

\[ X(j\Omega) = \left(\frac{1}{2j}\right) \frac{1}{100\pi + j(\Omega - 1000\pi)} - \left(\frac{1}{2j}\right) \frac{1}{100\pi + j(\Omega + 1000\pi)} \]
Sketch should show peaks at \(\approx ±1000\pi\) with amplitudes of 1/200π and bandwidths of 200π.

Problem 1.4

\[ X(e^{j\omega}) = \left(\frac{1}{2j}\right) \frac{1}{1 - e^{-\left(j\pi(\omega - \frac{\pi}{2})\right)}} - \left(\frac{1}{2j}\right) \frac{1}{1 - e^{-\left(j\pi(\omega + \frac{\pi}{2})\right)}} \]
Sketch should show peaks at \(\approx ±\pi/2\) with amplitudes of 10/π and bandwidths of π/10.