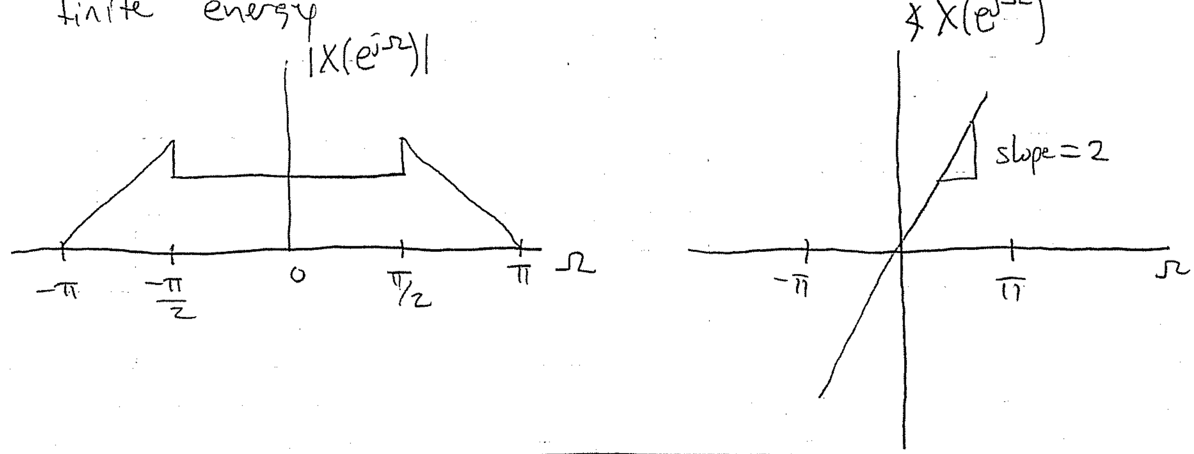
Consider the sequence $x[n]$ whose DTFT is shown below for $-\pi \le \Omega \le \pi$. We wish to determine whether or not, in the time domain, $x[n]$ is periodic, real, even, and/or of finite energy



- Periodicity in the time domain implies that $x[n]$ has a Fourier Series representation, which would appear in the DTFT as impulses. Since we do not see impulses in the magnitude plot, we conclude that $x[n]$ is not periodic
- Using the Symmetry properties from O&W Table 5.1, we know that a real-valued $x[n]$ must have a DTFT of even magnitude and a phase function that is odd. This is true of the above plots so $x[n]$ is real
- If $x[n]$ is even, then, by the symmetry properties for real signals, $X(e^{j\Omega})$ must be real and even, but we have
$$X(e^{j\Omega}) = |X(e^{j\Omega})| e^{j2\Omega}$$
which is complex valued, so $x[n]$ is not even
- Finally since the area under the magnitude curve is finite, and
$$\frac{1}{2\pi}\int_{2\pi} |X(e^{j\Omega})|^2 d\Omega = \sum_{n=-\infty}^{\infty} |x[n]|^2 = \text{finite number},$$
then $x[n]$ has finite energy