PROBLEM:

A feedback filter is characterized by the following frequency response:

$$\mathcal{H}(\hat{\omega}) = \frac{5}{1 - \frac{1}{2}e^{-j\hat{\omega}}}$$

If the input to the filter is a sinusoidal signal $x[n]$ with the following spectrum, determine the output, $y[n]$ for $-\infty < n < \infty$. Give a formula for $y[n]$ versus n.

SPECTRUM OF $x[n]$