# Oppenheim CH20BTECH11032

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## 1 Problem: 2.44(a)

Let $X(e^{\jmath\omega})$ denote the Fourier Transform of the signal x[n] shown in the figure P2.44-1. Evaluate $X(e^{\jmath\omega})$ at $\omega = 0$.
**Solution:**
At $\omega = 0$,
X(e$^{\jmath\omega}$) $= \sum_{n=-\infty}^{n=+\infty} x[n]e^{-j\omega n}$

X(e$^{\jmath\omega}$) $= \sum_{n=-\infty}^{n=+\infty} x$

X(e$^{\jmath\omega}$) $= 6$

## 2 Problem: 3.44(d)

When the input to an LTI system is

$x[n] = -\frac{1}{3}(\frac{1}{2})^n u[n] - \frac{4}{3}2^n u[-n-1]$

the output is:

$y[n] = \frac{1+z^{-1}}{(1-z^{-1})(1+\frac{1}{2}z^{-1})(1-2z^{-1})}$

Is the system stable? Is it casual?
**Solution:**
The ROC is $\frac{1}{2} < |z| < 2$. Since $x(z)$ has poles at 0.5 and 2, the poles at 1 and -0.5 are due to H(z).
Since H(z) is casual , its ROC is $|z| > 1$.

$H(z) = \frac{X(z)}{Y(z)} = 1 + \frac{\frac{2}{3}}{1-z^{-1}} + \frac{-\frac{2}{3}}{1+\frac{1}{2}z^{-1}}$

Since H(z) has a pole on the unit circle, the system is not stable.