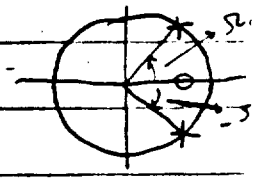
Solutions PS #7 EE 3230 8/26/94

7.1) 6.2

b) $x[n] = \cos(\Omega_0 n)\, u(-n-1)$

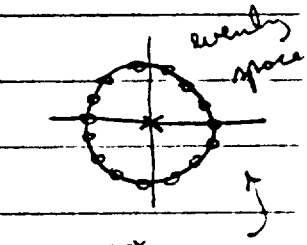
o.c. $\cos\Omega_0$

$$X(z) = -\frac{1-(\cos\Omega_0)z^{-1}}{1-2(\cos\Omega_0)z^{-1}+z^{-2}} \qquad |z|<1$$



c) $x[n] = \delta(n+N) - \delta(n-N)$

$$X(z) = z^N - z^{-N} \qquad 0<|z|<\infty$$

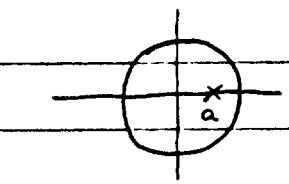


$z^N = z^{-N}$

$z^{2N} = 1 \Rightarrow z = e^{j\frac{2\pi k}{2N}} \quad k = 0, \ldots, 2N-1$

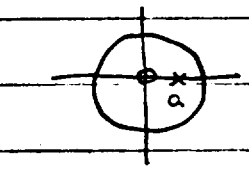
e) $x[n] = a^{n-1}u(n-1)$

$$X(z) = \frac{z^{-1}}{1-az^{-1}} \qquad |z|>|a|$$



f) $x[n] = a^{n+1}u(n+1)$

$$X(z) = \frac{z}{1-az^{-1}} \qquad |z|>|a|$$



7.2) 6.5 $\quad X(z) = \dfrac{2-z^{-1}}{(1-1.5z^{-1})(1+.5z^{-1})} = \dfrac{1}{(1-1.5z^{-1})} + \dfrac{1}{(1+.5z^{-1})}$

a) $|z|>1.5 \Rightarrow x[n] = \{(1.5)^n + (-.5)^n\}u(n)$

b) $.5<|z|<1.5 \Rightarrow x[n] = -(1.5)^n u(-n-1) + (-.5)^n u(n)$

c) $|z|<.5 \Rightarrow x[n] = -\{(1.5)^n + (-.5)^n\}u(-n-1)$

7.3) 6.11

a) $x[n] = a^{n_0} a^{(n-n_0)} u(n-n_0) \quad n_0 > 0$

$\therefore X(z) = \dfrac{a^{n_0} z^{-n_0}}{1 - az^{-1}} \quad |z| > |a|$

c) $x[n] = Od\{a^n u(n)\} \quad |a| < 1$

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

where $y[n] = a^n u(n)$

$Y(z) = \dfrac{1}{1-az^{-1}} \quad |z| > |a|$

$\Rightarrow X(z) = \dfrac{\frac{1}{2}}{1-az^{-1}} - \dfrac{\frac{1}{2}}{1-az} \quad |a| < |z| < 1/|a|$

f) $x[n] = u[n] * u[n]$

$X(z) = \dfrac{1}{1-z^{-1}} \cdot \dfrac{1}{1-z^{-1}} \quad |z| > 1$

7.4) 6.18