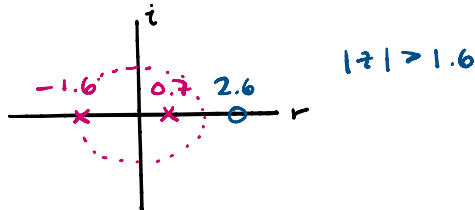


HW3

$$2) X(z) = \frac{3 - 7.8z^{-1} \rightarrow 3(1 - 2.6z^{-1})}{(1 - 0.7z^{-1})(1 + 1.6z^{-1})}$$

zeros $\rightarrow z = 0.7, z = -1.6$

poles $\rightarrow z = 2.6$



$$3) a. x[n] = nr^n \cos(\omega_0 n) u[n]$$

$$X(z) = \frac{(r \cos \omega_0) z^{-1}}{((1 - 2r \cos \omega_0) z^{-1} + r^2 z^{-2})^2} \quad |z| > r$$

$$b. x[n] = (0.2)^n u[n+1] \quad \text{right sided}$$

$$X(z) = \frac{0.2z^{-1}}{1 - 0.2z^{-1}}$$

poles $\rightarrow z = 0.2 \quad |z| < 0.2$

zeros $\rightarrow z = 0$

$$c. x[n] = (-0.5)^n u[-n-3]$$

$$z^{-3} X\left(\frac{1}{z}\right) = z^{-3} \frac{1}{1-z^{-1}}$$

$$X(z) = \frac{-0.5z^{-3}}{1+0.5z^{-1}}$$

poles $\rightarrow z = -2, z = 0$

zeros \rightarrow

$$d. x[n] = \frac{(n+1)(n+2)}{2} a^n u[n] = \left(\frac{n^2}{2} + \frac{3}{2}n + 1\right) a^n u[n]$$

$$= \frac{n^2 a^n}{2} u[n] + \frac{3na^n}{2} u[n] + a^n u[n]$$

\downarrow

\downarrow

\downarrow

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

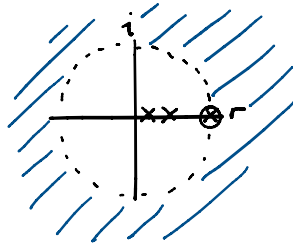
$$= \frac{az^{-1} + 3(az^{-1})(1-az^{-1}) + 2(az^{-1})(1-az^{-1})^2}{2(1-az^{-1})^3}$$

pole $\rightarrow z = 0$

zeros $\rightarrow z = \left\{ \frac{2}{3}a, \frac{1}{2}a \right\}$ $|z| < 0.5|a|$

4) a. poles $\rightarrow z = \{1, 0.5, 0.2\}$

zeros $\rightarrow z = 1$



b. $A_1(1 - z^{-1}) + A_2(1 - 0.5z^{-1}) + A_3(1 - 0.2z^{-1})$

$$= 1 - 2z^{-1} + 2z^{-2} - z^{-3}$$