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EE274_ProgEx03

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Also accessible through http://www.github.com/soymarwin/ee274/EE274_ProgEx03

A. The Bilateral Z-Transform

$$(a) \quad x(n) = \left(\frac{4}{3}\right)^n u(1-n)$$

$$x(n) = \left(\frac{4}{3}\right)^n u(-n+1)$$

$$X(z) = \sum_{n=-\infty}^{\infty} x(n) z^{-n}$$

$$X(z) = \sum_{n=-\infty}^{\infty} \left(\frac{4}{3}\right)^n u(-n+1) z^{-n}$$

$$\text{Let } k = -n + 1 \text{ and } n = 1 - k$$

$$X(z) = \sum_{n=-\infty}^{\infty} \left(\frac{4}{3}\right)^{1-k} u(k) z^{k-1}$$

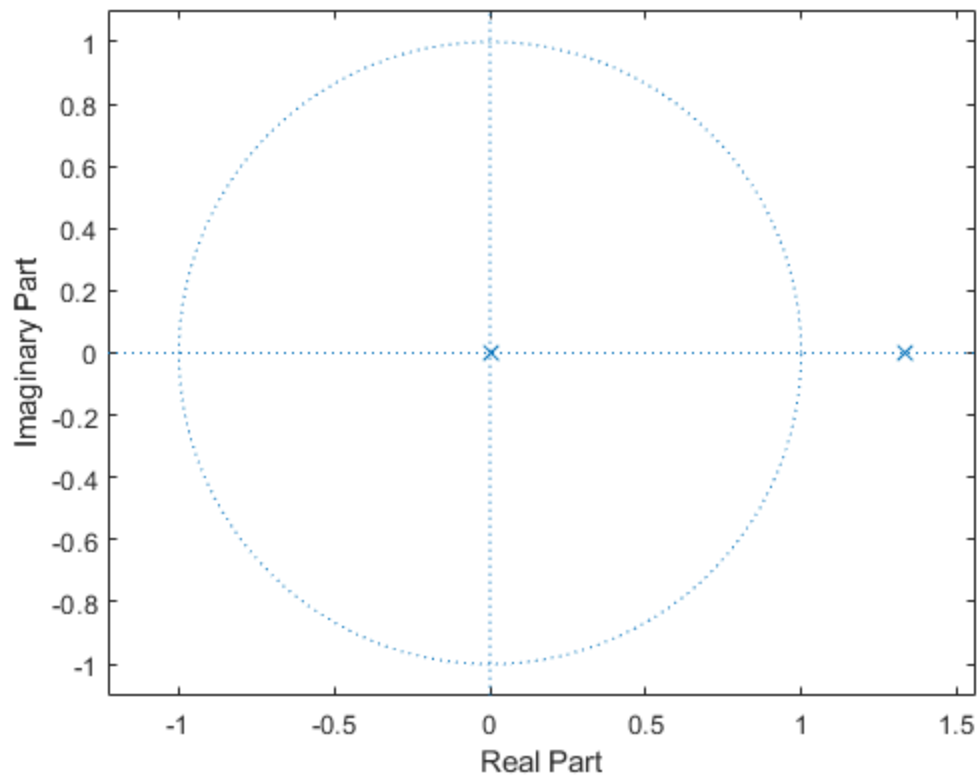
$$X(z) = \sum_{n=0}^{\infty} \left(\frac{4}{3}\right) \cdot \left(\left(\frac{4}{3}\right)^{-1}\right)^k \cdot \left(\left(1/z\right)^{-1}\right)^k \cdot z^{-1}$$

$$X(z) = \left(\frac{4z^{-1}}{3}\right) \sum_{n=0}^{\infty} \left(\frac{3}{4z^{-1}}\right)^k$$

$$X(z) = \left(\frac{4z^{-1}}{3}\right) \cdot \left(\frac{1}{1-\frac{3}{4z^{-1}}}\right), \quad 0 < |z| < \frac{4}{3}$$

$$\text{or } X(z) = \frac{16z^{-2}}{12z^{-1}-9}, \quad 0 < |z| < \frac{4}{3}$$

```
% z-plane for 1.(a)
A1_a_a=[-9 12 0];
A1_a_b=[0 0 16];
zplane(A1_a_b,A1_a_a);
```



(b) $x(n) = 2^{-|n|} + (\frac{1}{3})^{|n|}$

$$X(z) = \sum_{n=0}^{\infty} 2^{-n} z^{-n} + \sum_{n=0}^{\infty} (\frac{1}{3})^n z^{-n}$$

$$X(z) = \sum_{n=0}^{\infty} (\frac{z^{-1}}{2})^n + \sum_{n=0}^{\infty} (\frac{z^{-1}}{3})^n$$

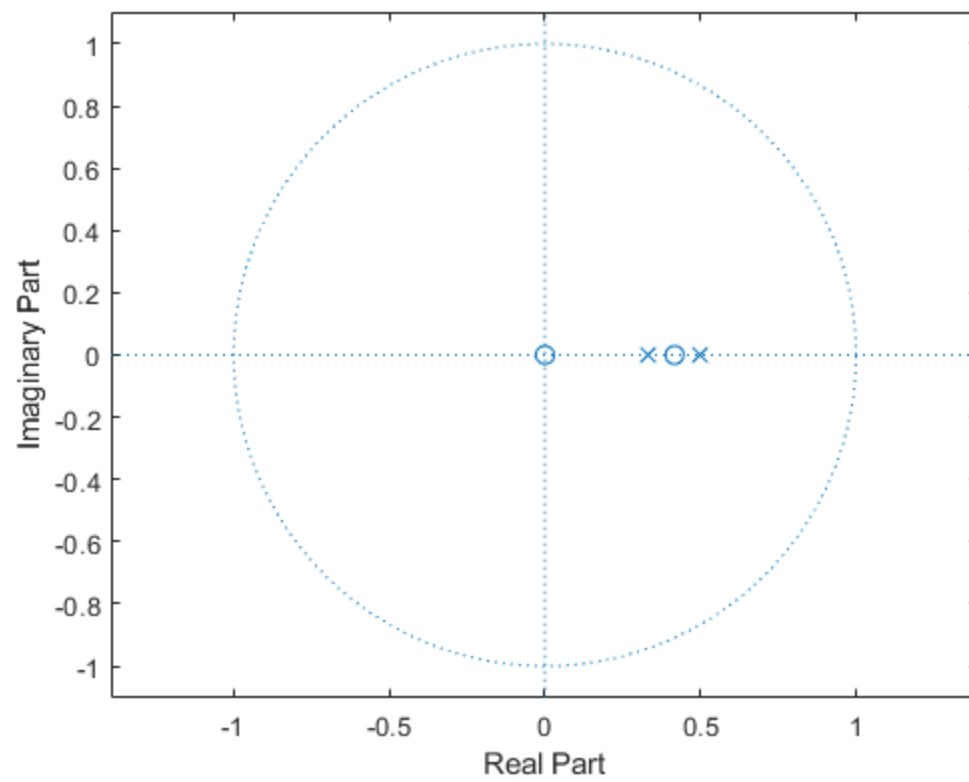
$$X(z) = \frac{1}{1-\frac{z^{-1}}{2}} + \frac{1}{1-\frac{z^{-1}}{3}}$$

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

$$X(z) = \frac{12-5z^{-1}}{(2-z^{-1})(3-z^{-1})}, \quad \frac{1}{3} < |z| < \frac{1}{2}$$

$$\text{or } X(z) = \frac{12-5z^{-1}}{6-5z^{-1}+z^{-2}}, \quad \frac{1}{3} < |z| < \frac{1}{2}$$

```
% z-plane for 1.(b)
A1_b_a=[6 -5 1];
A1_b_b=[12 -5 0];
zplane(A1_b_b,A1_b_a);
```



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