Marwin B. Alejo 2020-20221
EE274_ProgEx03

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

A. The Bilateral Z-Transform

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

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

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

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

$Let\ k = -n+1\ and\ n = 1-k$

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

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

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

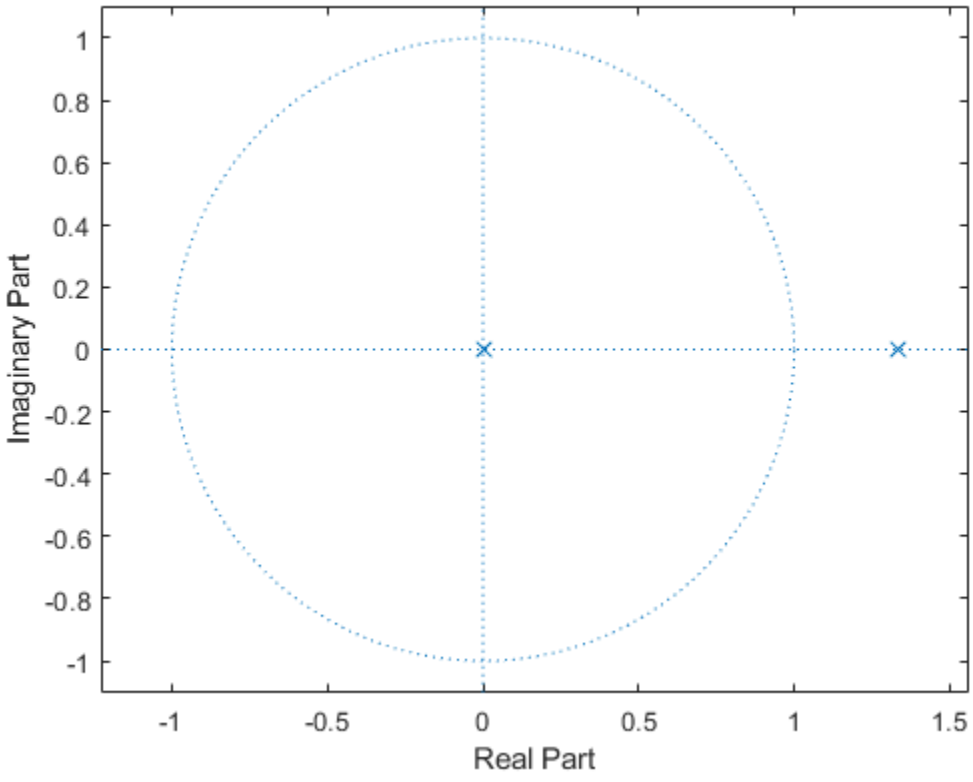
$X(z) = (\frac{4z^{-1}}{3}) \cdot (\frac{1}{1-\frac{3}{4z^{-1}}}),\ 0\ < |\ z\ | <\ \frac{4}{3}$

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

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

```
% z-plane for 1.(a)
A1_a_a=[-9, 12, 0];
A1_a_b=[0, 0, -16];
zplane(A1_a_b,A1_a_a);
% verification of ztransform fxn v. original sequence
[delta,n]= impseq(0,0,7);
A_a_Xz=filter(A1_a_b,A1_a_a,delta) %A_a_Xz is z-transform sequence
A_a_Xn=[(4/3).^n].*stepseq(1,0,7) %A_A_Xn is the original sequence
```

```
A_a_Xz =

  Columns 1 through 7

         0         0    1.7778    2.3704    3.1605    4.2140    5.6187

  Column 8

    7.4915


A_a_Xn =

  Columns 1 through 7

         0         0    1.7778    2.3704    3.1605    4.2140    5.6187

  Column 8

    7.4915
```



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

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

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

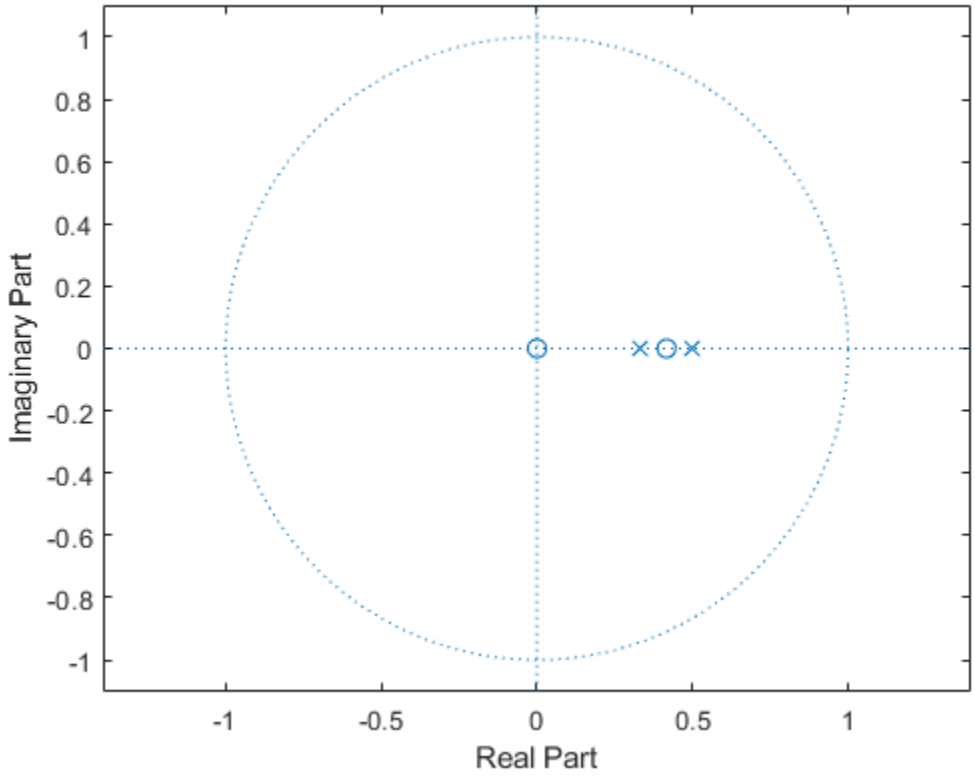
$$X(z) = \frac{1}{1-\frac{z^{-1}}{2}} + \frac{1}{1-\frac{z^{-1}}{3}}$$

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

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

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

```
% 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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