ECE 3510 homework # Z1 Due:

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4/19/22

c

1. Like problem 6.4 in the text. Sketch the time function $x(k)$ that you would associate with the following poles. Only a sketch is required, but be as precise as possible. You may wish to use Matlab or a spreadsheet to plot these.

   a) $p_1 = 0.3$ and, $p_2 = 0.9$

   b) $p_1 = 1$, $p_2 = -1$

   c) $p_1 = e^{j\cdot\frac{\pi}{6}}$, $p_2 = e^{-j\cdot\frac{\pi}{6}}$

   d) $p_1 = 0.9\cdot j$, $p_2 = -0.9\cdot j$

2. See the back of this page.

3. Problem 6.1 in the Bodson text.
   Find $x(0)$ if the z-transform of $x(k)$ is:

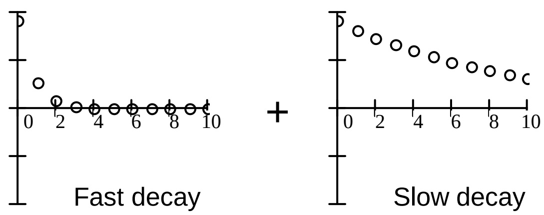
   a) $X(z) = \frac{a\cdot z - 1}{z - 1}$ b) $X(z) = \frac{z}{z^2 - a\cdot z + a^2}$

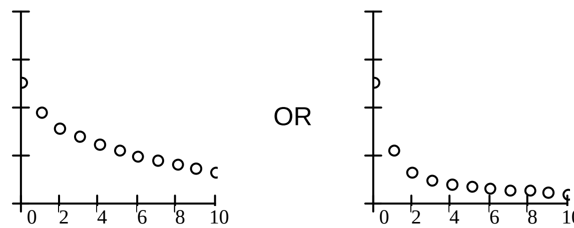
4. Problem 6.7 in the text.

Answers

1. Actual signals may have different magnitudes and/or phase angles. You can't tell those things from the pole locations.

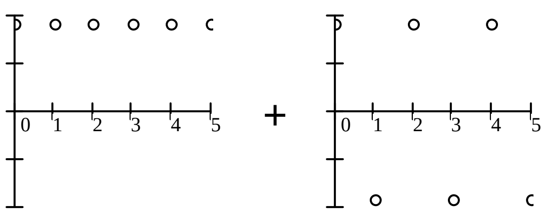
a) $p_1 = 0.3$ $p_2 = 0.9$

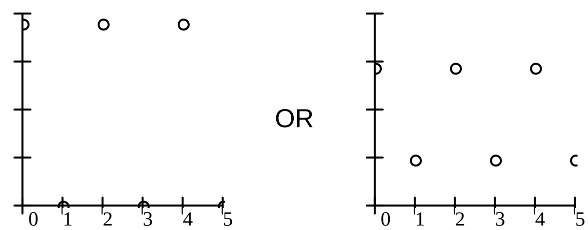




Or many others, depending on relative magnitudes

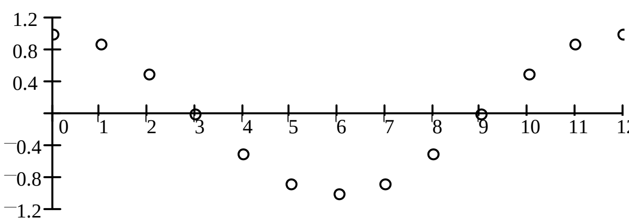
b) $p_1 = 1$ $p_2 = -1$



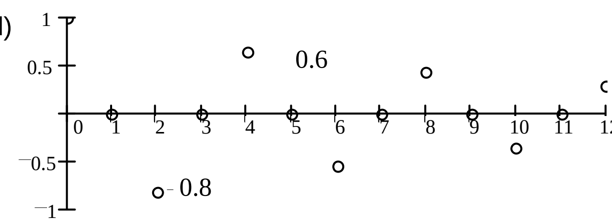


Or many others, depending on relative magnitudes

c)



d)



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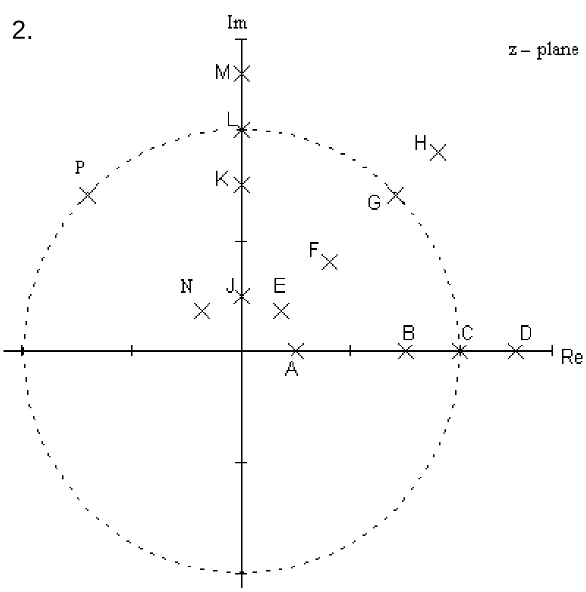


3. a) a b) 0

4. (6.7)

	Bounded	Converges	$x(\infty)$
a)	yes	yes	0
b)	yes	yes	0 vanishes in a finite time (all poles are at zero)
c)	yes	no	
d)	yes	yes	8/9
e)	yes	yes	2
f)	no		
g)	yes	no	
h)	yes	yes	1

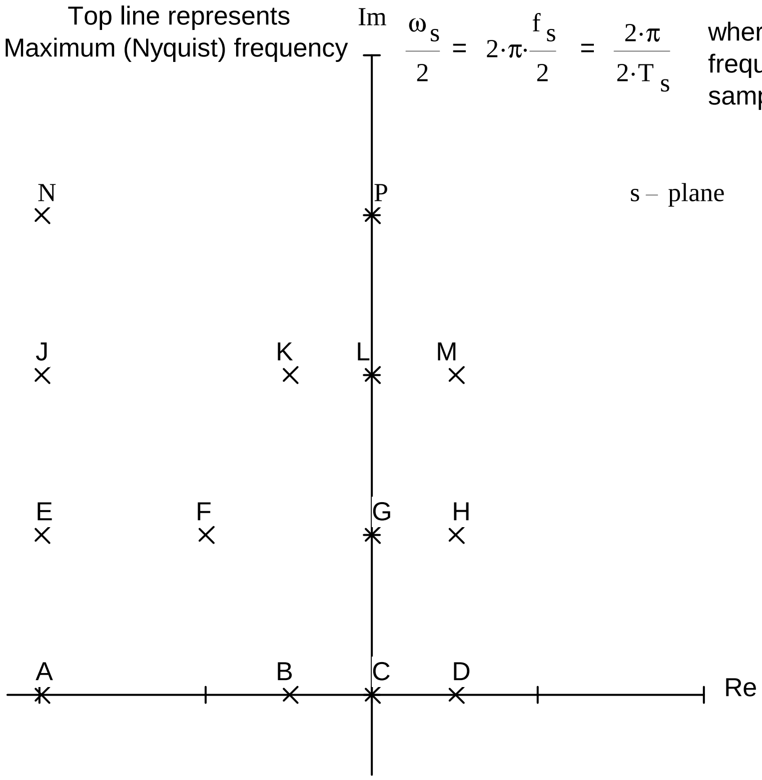
Name: ____________________

2. For each of the pole locations shown on the s-plane below, Draw and label a similar pole location on the z-plane.

Top line represents Maximum (Nyquist) frequency

$$\frac{\omega_s}{2} = 2\cdot\pi\cdot\frac{f_s}{2} = \frac{2\cdot\pi}{2\cdot T_s}$$

where f_s is the digital sampling frequency, so this line is 1/2 the sampling frequency



Note: The poles on both planes do come in complex-conjugate pairs, but I have only shown those above the real axis.

You may do the same below.

unit circle is shown as dotted line