EEL 3135 – Quiz 5
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20 minutes close book

By signing my name below, I declare that I have not given or received help from others during the quiz.

Name: SOLUTION, ID #:_____

Please answer in the space provided (1 question)

1- The transfer function of a second order IIR filter is

$$H(z)=\frac{12+24z^{-1}}{12+13z^{-1}+3z^{-2}}$$

Consider all initial conditions zero.

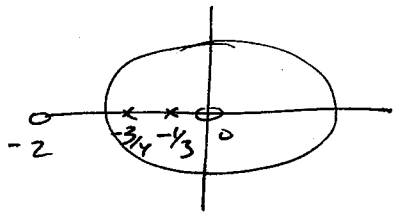
a. Draw the pole-zero plot.
b. Find the impulse response of the system.

You will need the following relation $a^n u(n) \leftrightarrow \frac{1}{1-az^{-1}}$

$12z^2+13z+3=0$

$z=-\frac{1}{3}, -\frac{3}{4}$

a) $H(z)=\frac{12z^2+24z}{(4z+3)(3z+1)} = \frac{1+2z^{-1}}{(1+\frac{3}{4}z^{-1})(1+\frac{1}{3}z^{-1})}$



b) $H(z)=\frac{1+2z^{-1}}{(1+\frac{3}{4}z^{-1})(1+\frac{1}{3}z^{-1})} = \frac{A}{(1+\frac{3}{4}z^{-1})} + \frac{B}{(1+\frac{1}{3}z^{-1})}$

$A=H(z)\left(1+\frac{3}{4}z^{-1}\right)\Big|_{z=-\frac{3}{4}} = -3$

$B=H(z)\left(1+\frac{1}{3}z^{-1}\right)\Big|_{z=-\frac{1}{3}} = 4$

So $H(z)=\frac{-3}{(1+\frac{3}{4}z^{-1})} + \frac{4}{1+\frac{1}{3}z^{-1}} \Rightarrow h(n)=-3\left(-\frac{3}{4}\right)^n u(n)+4\left(-\frac{1}{3}\right)^n u(n)$