PROBLEM:

Consider the following pole-zero plot:
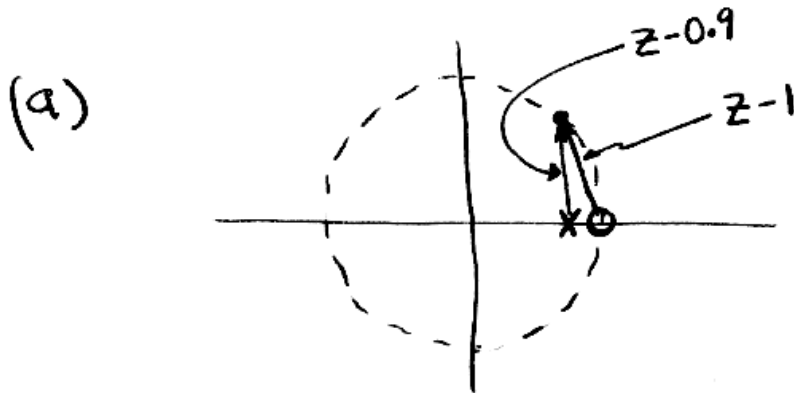

Pole-Zero Plot for Problem 9
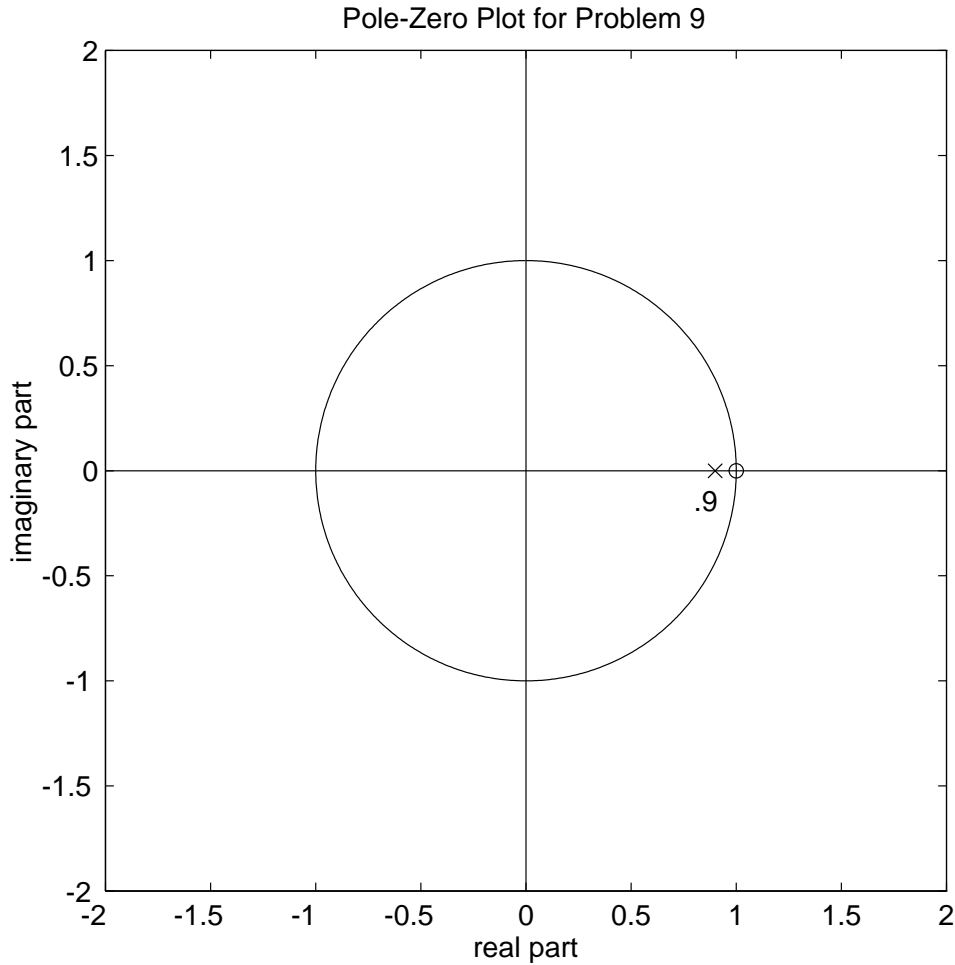
(a) In the above figure, draw the vectors representing the complex numbers $z - 1$ and $z - 0.9$ for $z = e^{j\pi/4}$.

(b) Determine the value of the frequency response $H(e^{j\hat{\omega}})$ at $\hat{\omega} = \pi$.

(c) Sketch the magnitude of the frequency response, $|H(e^{j\hat{\omega}})|$, as a function of $\hat{\omega}$ for $-\pi < \hat{\omega} < \pi$.

SOLUTION

(a)

$z - 0.9$

$z - 1$

(b) $\quad H(z) = \dfrac{z-1}{z-0.9} \qquad\qquad \hat{\omega} = \pi \implies z = e^{j\pi} = -1$

$$H(z) = \frac{(-1)-1}{e^{j\pi}-0.9} = \frac{-2}{-1.9} = 1.05$$

(c)

$|H(e^{j\hat{\omega}})|$

1.05

$-\pi \qquad 0 \qquad \pi \qquad \hat{\omega}$