CCO50- Digital Speech Processing

Short Test 8

Description: Find the difference equation matching the IIR filter $H[z] = \frac{1-2z^{-1}}{1-0.5z^{-1}}$. Then, plot its poles and zeros in the z-plane

$$H[z] = \frac{Y[z]}{X[z]} = \frac{1-2z^{-1}}{1-0.5z^{-1}}$$
$$Y[z] - 0.5Y[z]z^{-1} = X[z] - 2X[z]z^{-1}$$
$$\text{from frequency domain to time domain:}$$
$$y[n] - 0.5y[n-1] = x[n] - 2x[n-1]$$
$$y[n] = x[n] - 2x[n-1] + 0.5y[n-1]$$

To find the poles, it is necessary to find the values that make the denominator of H[z] equal to zero.

To find the zeros, it is necessary to find the values that make the numerator of H[z] equal to zero.

$$\text{poles}$$
$$1 - 0.5z^{-1} = 0$$
$$z^{-1} = 2$$
$$\frac{1}{z} = 2$$
$$z = 0.5$$
$$\text{zeros}$$
$$1 - 2z^{-1} = 0$$
$$\frac{1}{z} = \frac{-1}{-2}$$
$$z = 2$$

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