PROBLEM:

For the following functions, determine all of the poles and zeroes, including those at the origin and those at infinity. Indicate any repeated pole or zeroes.

(a) The poles and zeros of $H(z) = \dfrac{2}{1 - z^{-1}}$ are:

- (a) pole at $z = 0$, zero at $z = 1$
- (b) pole at $z = -1$, zero at $z = 0$
- (c) pole at $z = 1$, zero at $z = 1$
- (d) pole at $z = 1$, zero at $z = \infty$
- (e) none of the above

(b) $H(z) = \dfrac{z^2 + 1}{z^3}$

POLES =
ZEROS =

(c) $H(z) = \dfrac{(3 - z^{-1})(2 - 2z^{-1})}{1 + z^{-1}}$

POLES =
ZEROS =

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SOLUTION

For the following functions, determine all of the poles and zeroes, including those at the origin and those at infinity. Indicate any repeated pole or zeroes.

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(c) pole at $z = 1$, zero at $z = 1$

(d) pole at $z = 1$, zero at $z = \infty$

(e) none of the above

$$H(z) = \frac{2z}{z-1}$$

zero at $z=0$

pole at $z=1$

(b) $H(z) = \dfrac{z^2 + 1}{z^3}$

POLES = $0, 0, 0$

ZEROS = $+j, -j, \infty$

$$z^2 + 1 = 0 \Rightarrow z = \pm j$$

$$z^3 = 0 \Rightarrow z = 0$$

$$\lim_{z \to \infty} H(z) = 0$$

(c) $H(z) = \dfrac{(3 - z^{-1})(2 - 2z^{-1})}{1 + z^{-1}} = \dfrac{(3z-1)(2z-2)}{z(z+1)}$

POLES = $0, -1$

ZEROS = $1/3, 1$

$$3 - z^{-1} = 0 \Rightarrow 3z - 1 = 0 \Rightarrow z = 1/3$$

$$2 - 2z^{-1} = 0 \Rightarrow 2z - 2 = 0 \Rightarrow z = 1$$

$$z + 1 = 0 \Rightarrow z = -1$$

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