

EE432 Fall 2009: In-Class Activities

09/16/2009:

Using MATLAB's *conv* function, multiply the following terms together to determine the polynomial:

$$(1) \quad (x + 3)(x + 2) = \underline{x^2 + 5x + 6}$$

$$(2) \quad (x + 1)(x^2 + x - 6) = \underline{x^3 + 2x^2 - 5x - 6}$$

$$(3) \quad (x+1.33)^3 = \underline{x^3 + 3.99x^2 + 5.3067x + 2.3526}$$

$$(4) \quad (x^3 + 2x - 4)(x^5 - 0.8) = \underline{x^8 + 2x^6 - 4x^5 - 0.8x^3 - 1.6x + 3.2}$$

Using MATLAB's *roots* function, find the poles and zeros of:

$$(z^4 - z^3 + 2z - 0.5) / (z^5 - 10z^4 + 2z^2 + 1)$$

Answer:

Numerator roots (zeros):

-1.0860
0.9149 + 0.9796i
0.9149 - 0.9796i
0.2563

Denominator roots (poles):

9.9798
0.6721
-0.6438
-0.0040 + 0.4812i
-0.0040 - 0.4812i

A transfer function has zeros at $z = 0.1 + 0.5j$, $z = 0.1 - 0.5j$, and $z = 2$. Its poles are at $z = e^{j\pi/8}$, $z = e^{-j\pi/8}$, $z = 0.6 + 0.3j$ and $z = 0.6 - 0.3j$.

Write the transfer function as a numerator polynomial divided by a denominator polynomial.

Answer:

$$\frac{x^3 - 2.2x^2 + 0.66x - 0.52}{x^4 - 3.0478x^3 + 3.6673x^2 - 2.0315x + 0.45}$$