**ECE 3512: SignalS – Continuous and Discrete**

# Recitation No. 9: Laplace Transforms

In this recitation, we will explore visualization of the Laplace Transform and its relationship to frequency response and impulse response.

Consider the transfer function:



(1) Let *a = 2*, *b = 3* and *c = 1*. Find the poles and zeroes both analytically and in MATLAB. Plot the magnitude of the frequency response as a (3D) function of the complex variable, *s*, using the mesh plot function (or the equivalent) in MATLAB.

(2) Let *a* *= 2* and *b = 3*. Plot the magnitude of the frequency response as a function of *f* (Hz). Demonstrate what this function corresponds to in the plot generated in (1).

(3) Derive the impulse response of this system using analytic techniques and verify this result in MATLAB.

(4) Constrain *b = a\** (the conjugate of a), and *c* to be a real value. Design *H(s)* to be a bandpass filter centered at a frequency of 100 Hz and a bandwidth of 25 Hz. Verify that your frequency meets your design constraints in MATLAB.