Laplace transforms:

- $\mathcal{L}\{f'(t)\} = sF(s) - f(0^-)$
- $\mathcal{L}\{f''(t)\} = s^2F(s) - sf(0^-) - f'(0^-)$

Other Laplace transforms:

- $\mathcal{L}\{sin(at)\} = \frac{a}{s^2+a^2}$
- $\mathcal{L}\{cos(at)\} = \frac{s}{s^2+a^2}$

General form of inverse Laplace for conjugate roots of R and P:

- $\mathcal{L}^{-1}\left\{\frac{R}{s-P} + \frac{R_{conj}}{s-P_{conj}}\right\} = 2 * abs(R) * \exp(Re(P)t) * \cos\big(Im(P)t + angle(R)\big)$

Z Transforms

- $Z\{f(n-1)\} = z^{-1}F(z) + f(-1)$
- $Z\{f(n-2)\} = \ z^{-2}F(Z) + z^{-1}f(-1) + f(-2)$

Other Z transforms:

- $Z\{u(n)\} = \frac{1}{1-z^{-1}}$
- $Z\{\lambda^{-n}u(n)\} = \frac{1}{1-\lambda^{-1}z^{-1}}$
- $Z\{\delta(n)\} = 1$
- $Z\{sin(\Omega_0 n)\} = \frac{sin(\Omega_0)z^{-1}}{1-2cos(\Omega_0)z^{-1}+z^{-2}}$
- $Z\{cos(\Omega_0 n)\} = \frac{1-cos(\Omega_0)z^{-1}}{1-2cos(\Omega_0)z^{-1}+z^{-2}}$

Inverse Z transforms:

- $Z^{-1}\{Az^{-k}\} = A\delta(n-k)$
- $Z^{-1}\left\{\frac{A}{z^{-1}-\lambda}\right\} = \frac{A(-1)}{\lambda^{n+1}}u(n)$

General form of inverse Z for conjugate R and P:

- $Z^{-1}\left\{\frac{R}{z^{-1}-P} + \frac{R_{conj}}{z^{-1}-P_{conj}}\right\} = -2 * \frac{abs(R)}{abs(P)^{n+1}} * \cos\big(angle(P)(n+1) + angle(R)\big)$

Fourier Transforms

- $\mathcal{F}\big(Asin(\omega_0 t)\big) = \frac{A\pi}{j}\big(\delta(\omega-\omega_0) - \delta(\omega+\omega_0)\big)$
- $\mathcal{F}\big(Acos(\omega_0 t)\big) = A\pi\big(\delta(\omega-\omega_0) + \delta(\omega+\omega_0)\big)$
- $\mathcal{F}(Aexp(j\omega_0 t)) = A2\pi\delta(\omega-\omega_0)$
- $\mathcal{F}(1) = 2\pi\delta(\omega)$

Steady state output of a filter with a sinusoidal input and transfer function $H(j\omega)$:

- $Asin(\omega_n t) => |H(j\omega_n)| * Asin\left(\omega_n t + \angle H(j\omega_n)\right)$