Modsim cheat sheet

Simple Rotations

$$R_x(\theta) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos(\theta) & -\sin(\theta) \\ 0 & \sin(\theta) & \cos(\theta) \end{bmatrix}$$

$$R_y(\theta) = \begin{bmatrix} \cos(\theta) & 0 & \sin(\theta) \\ 0 & 1 & 0 \\ -\sin(\theta) & 0 & \cos(\theta) \end{bmatrix}$$

$$R_z(\theta) = \begin{bmatrix} \cos(\theta) & -\sin(\theta) & 0 \\ \sin(\theta) & \cos(\theta) & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Positive Real

$H(s)$ positive real iff

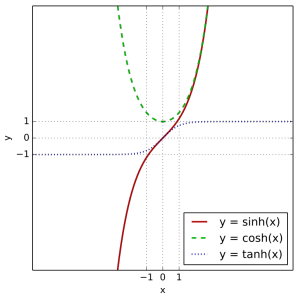
1. No poles with real part > 0
2. $H(s)$ real for all positive and real s
3. $\text{Re}[H(s)] \geq 0$ for all $\text{Re}[s] > 0$.

Euler's Formula

$$e^{ix} = \cos(x) + i\sin(x)$$

Hyperbolic Trig

$$\sinh(\sigma + j\omega) = \sinh\sigma\cos\omega + j\cosh\sigma\sin\omega$$
$$\cosh(\sigma + j\omega) = \cosh\sigma\cos\omega + j\sinh\sigma\sin\omega$$



Skew Symmetric Matrix

$$\mathbf{a} = \begin{bmatrix} a_1 \\ a_2 \\ a_3 \end{bmatrix} \iff \mathbf{a}^\times = \begin{bmatrix} 0 & -a_3 & a_2 \\ a_3 & 0 & -a_1 \\ -a_2 & a_1 & 0 \end{bmatrix}$$

- $u \times v$ corresponds to $\mathbf{u}^\times\mathbf{v}$
- $(\mathbf{a}^\times)^\top = -(\mathbf{a}^\times)$