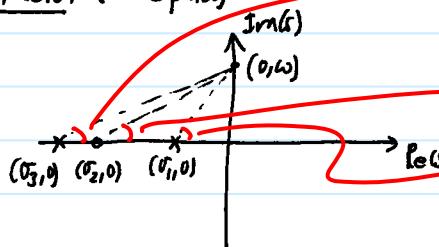


Again, we're mainly concerned here w/ phase margin; i.e., stability.

How does a RHP zero affect the PM?

→ compare a LHP zero w/ a RHP zero:

① LHP zero: (and 2 poles)



$$|H(j\omega)| = \frac{\sqrt{\omega^2 + \omega_0^2}}{\sqrt{\omega^2 + \omega_1^2} \sqrt{\omega^2 + \omega_2^2}}$$

$$\angle H(j\omega) = +\tan^{-1}\left(\frac{\omega}{\omega_0}\right) - \tan^{-1}\left(\frac{\omega}{\omega_1}\right) - \tan^{-1}\left(\frac{\omega}{\omega_2}\right)$$

$$= \tan^{-1}\left(\frac{\omega}{\omega_0}\right) - \tan^{-1}\left(\frac{\omega}{\omega_1}\right) - \tan^{-1}\left(\frac{\omega}{\omega_2}\right)$$

Thus:

$$\omega = 0$$

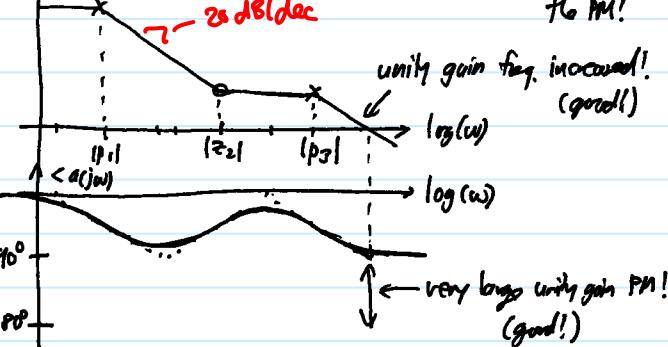
$$\omega = \omega_0$$

$$\omega = \omega_1$$

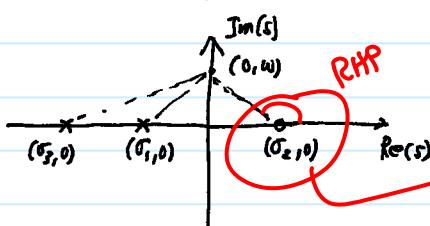
$$\omega = \omega_2$$

$$\omega = \infty$$

A LHP zero can really improve the performance & stability of an op amp
PB Ckt. Σ



② RHP zero: (and 2 poles)



$$|H(j\omega)| = \frac{\sqrt{\omega^2 + \omega_0^2}}{\sqrt{\omega^2 + \omega_1^2} \sqrt{\omega^2 + \omega_2^2}}$$

$$\angle H(j\omega) = +\tan^{-1}\left(\frac{\omega}{-\omega_0}\right) - \tan^{-1}\left(\frac{\omega}{-\omega_1}\right) - \tan^{-1}\left(\frac{\omega}{-\omega_2}\right)$$

$$= +\tan^{-1}\left(-\frac{\omega}{\omega_0}\right) - \tan^{-1}\left(\frac{\omega}{\omega_1}\right) - \tan^{-1}\left(\frac{\omega}{\omega_2}\right)$$

Thus:

A RHP zero is detrimental because:

- ① extends the ω_u
- ② while continuing to drop the phase

↓
instability!

Problem!

→ to solve, must first understand where the zero comes from!

unity gain freq. still extended (bad! since the phase keeps going down!)

