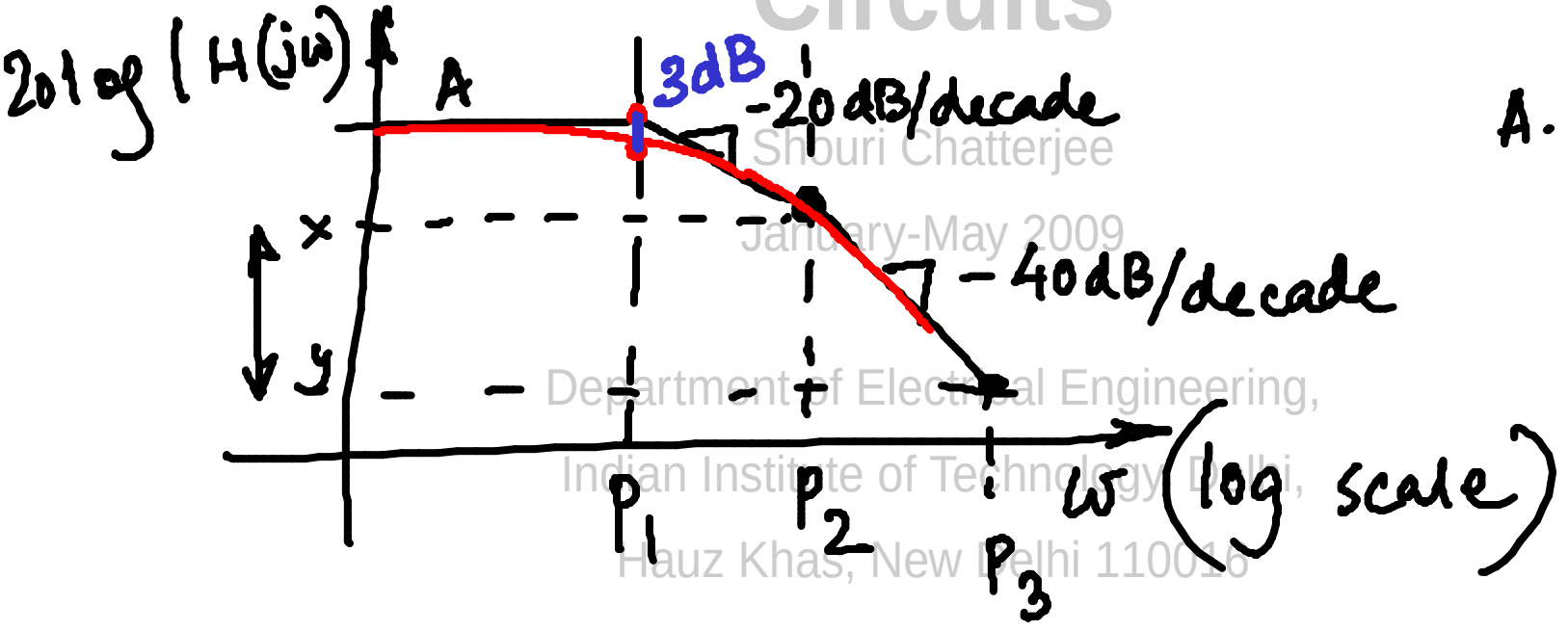
$$P_1 \ll P_2 \ll z_1 \ll z_2$$

$$-20\log\left|1+j\frac{\omega}{P_1}\right| - 20\log\left|1+j\omega/P_2\right| + \cdots\cdots$$



$$A \cdot P_1 = x \cdot P_2$$

pole ⟶ slope decreases by 20 dB/decade — phase decreases by 90°

zero ⟶ slope increases by 20 dB/decade

- RHP zero: ϕ decreases by 90°
- LHP zero: ϕ increases by 90°

Rounding off: 3dB — 45°

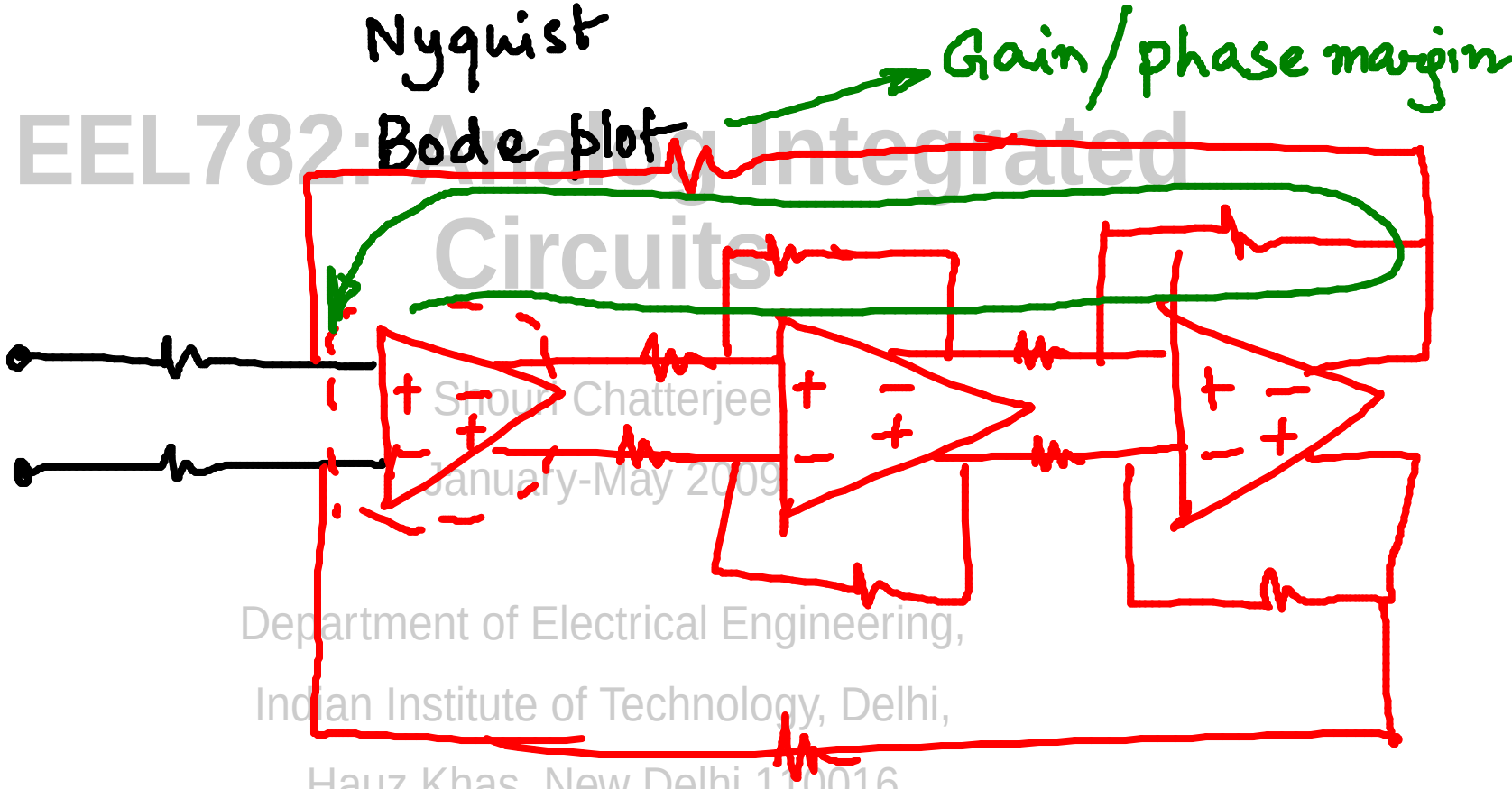
$$20 \log \left| \frac{1}{1+j} \right|$$

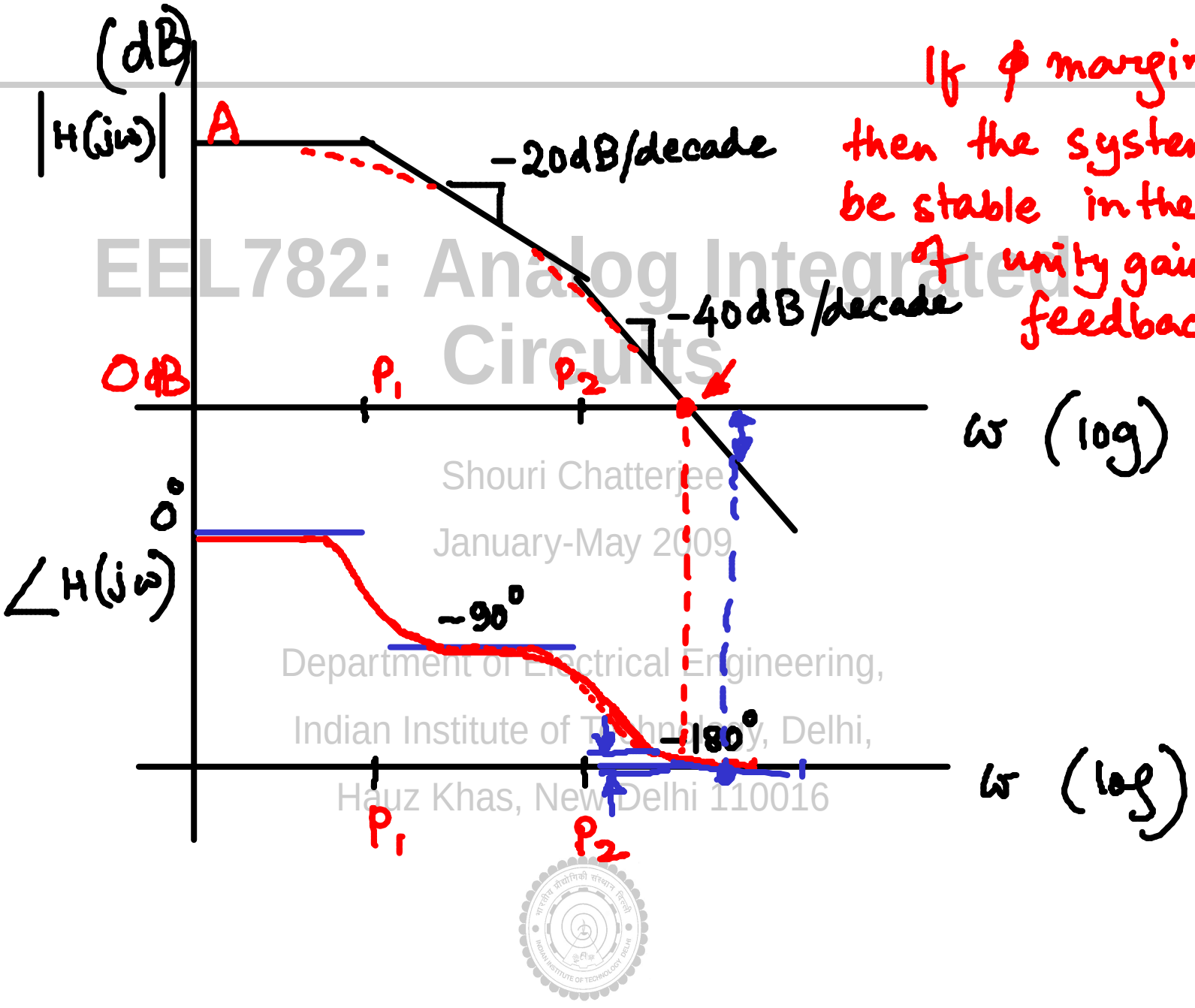
Why ?

Routh - Hurwitz

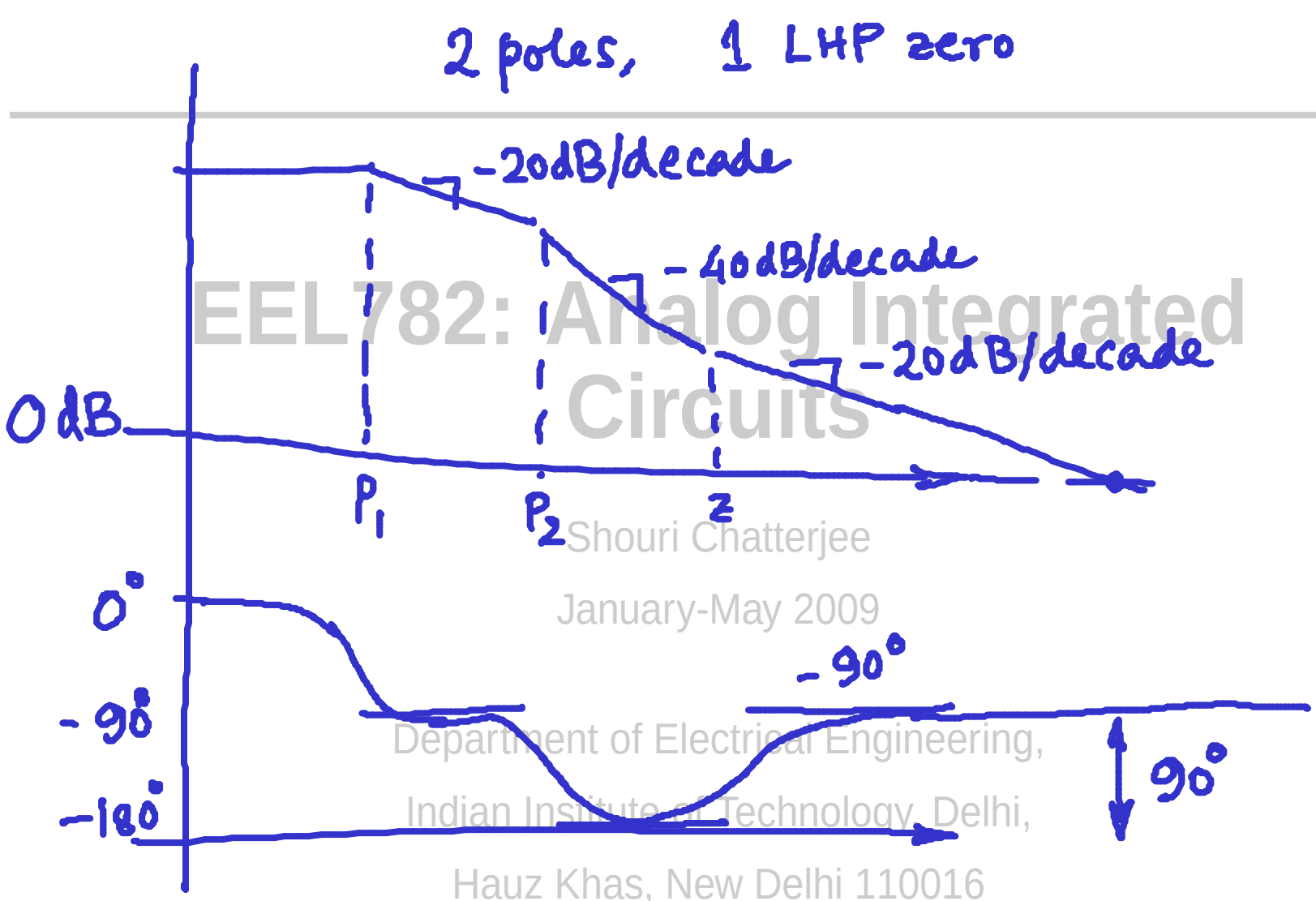
Nyquist

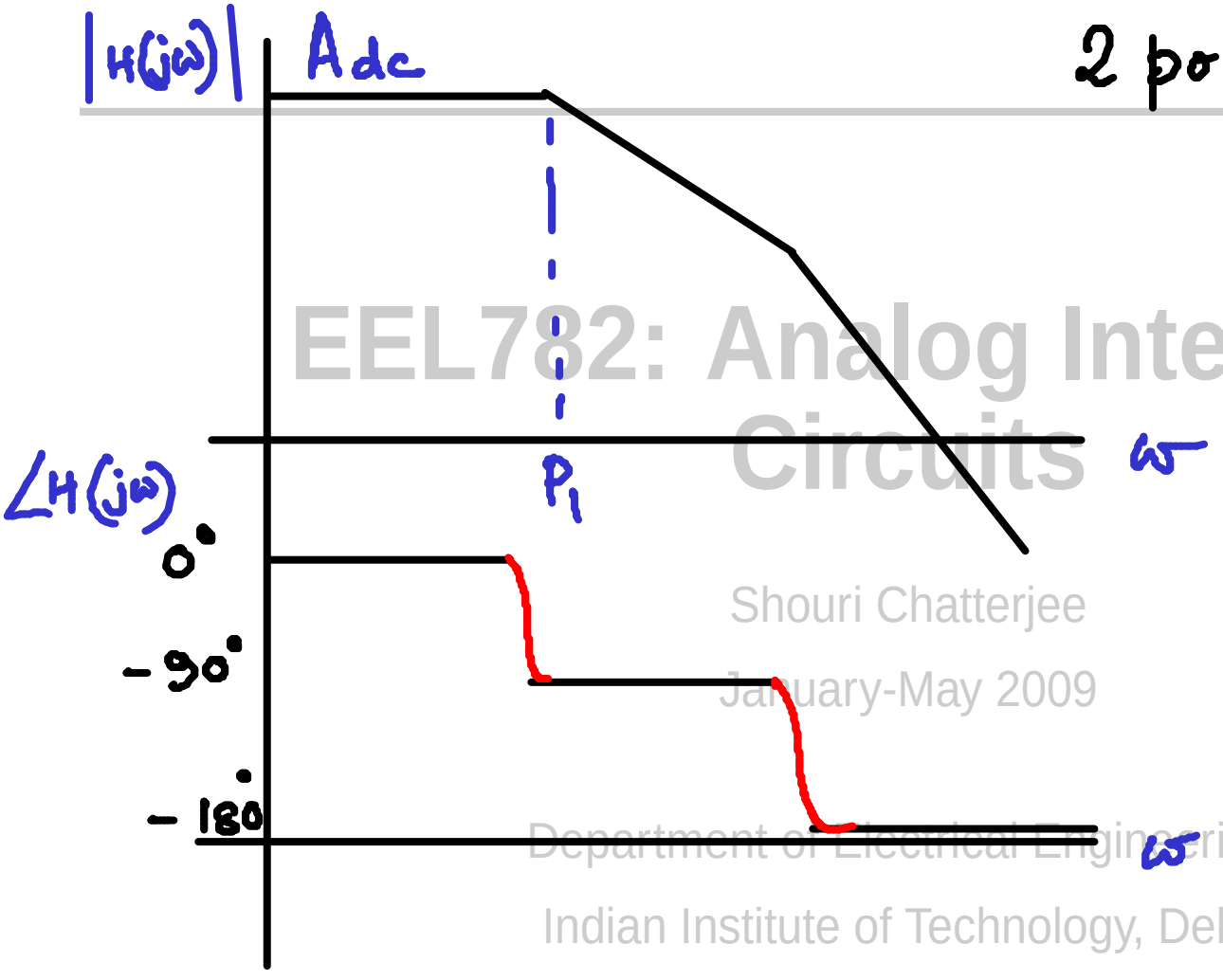
Bode plot





If ϕ margin > 0 then the system will be stable in the presence of unity gain -ve feedback.





What is P_2 such that $PM = \phi$