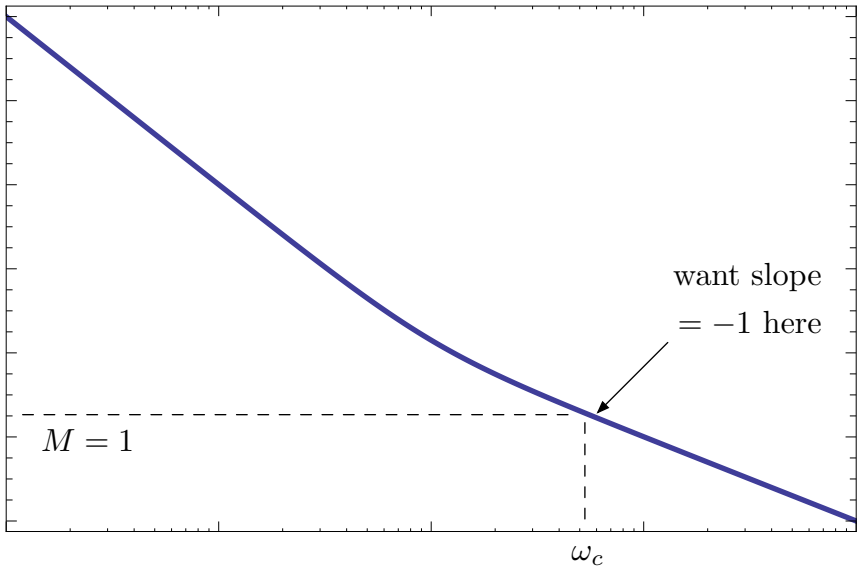
Bode's Gain-Phase Relationship

Gain-Phase Relationship. Far enough from break-points,

$$\text{Phase} \approx \text{Magnitude Slope} \times 90^\circ$$

This suggests the following rule of thumb:



- M has slope -2 at ω_c
  $\Rightarrow \phi(\omega_c) = -180^\circ$
  $\Rightarrow$ bad (no PM)
- M has slope -1 at ω_c
  $\Rightarrow \phi(\omega_c) = -90^\circ$
  $\Rightarrow$ good (PM $= 90^\circ$)

— this is an important *design guideline*!!

(Similar considerations apply when M-plot has positive slope – depends on the t.f.)