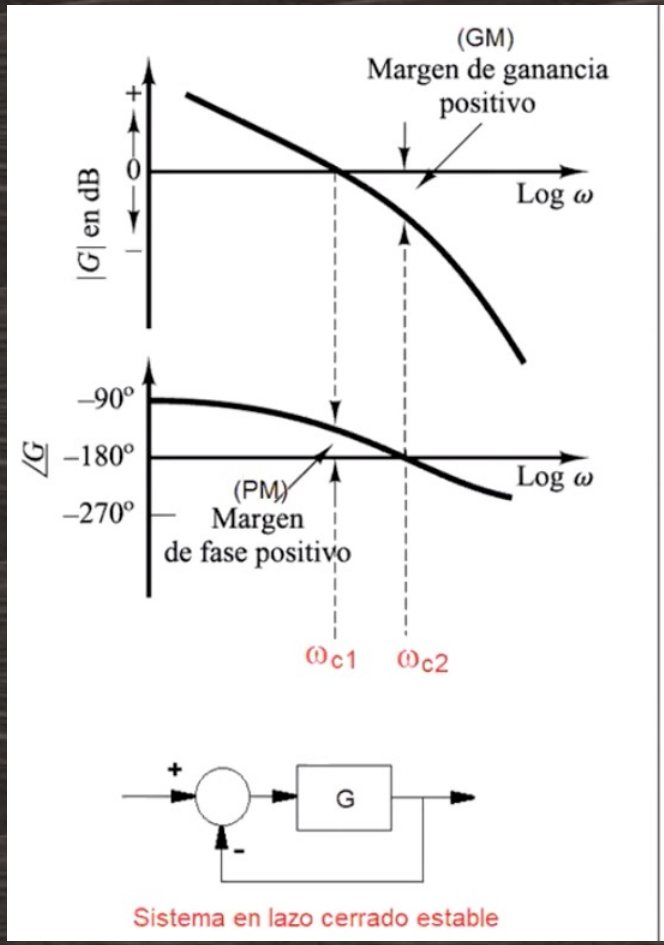
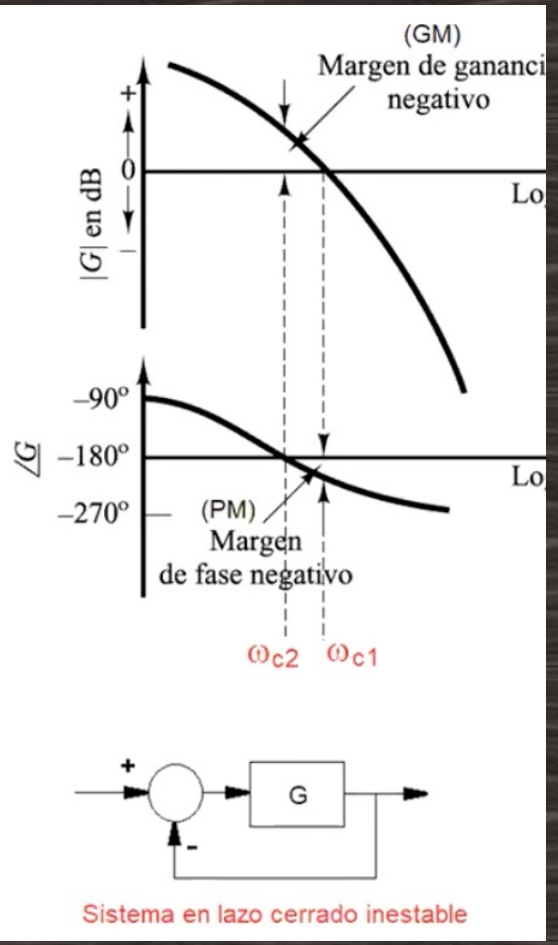
ESTABILIDAD DE BODE. MARGEN DE GANANCIA Y MARGEN DE FASE



Sistema en lazo cerrado estable

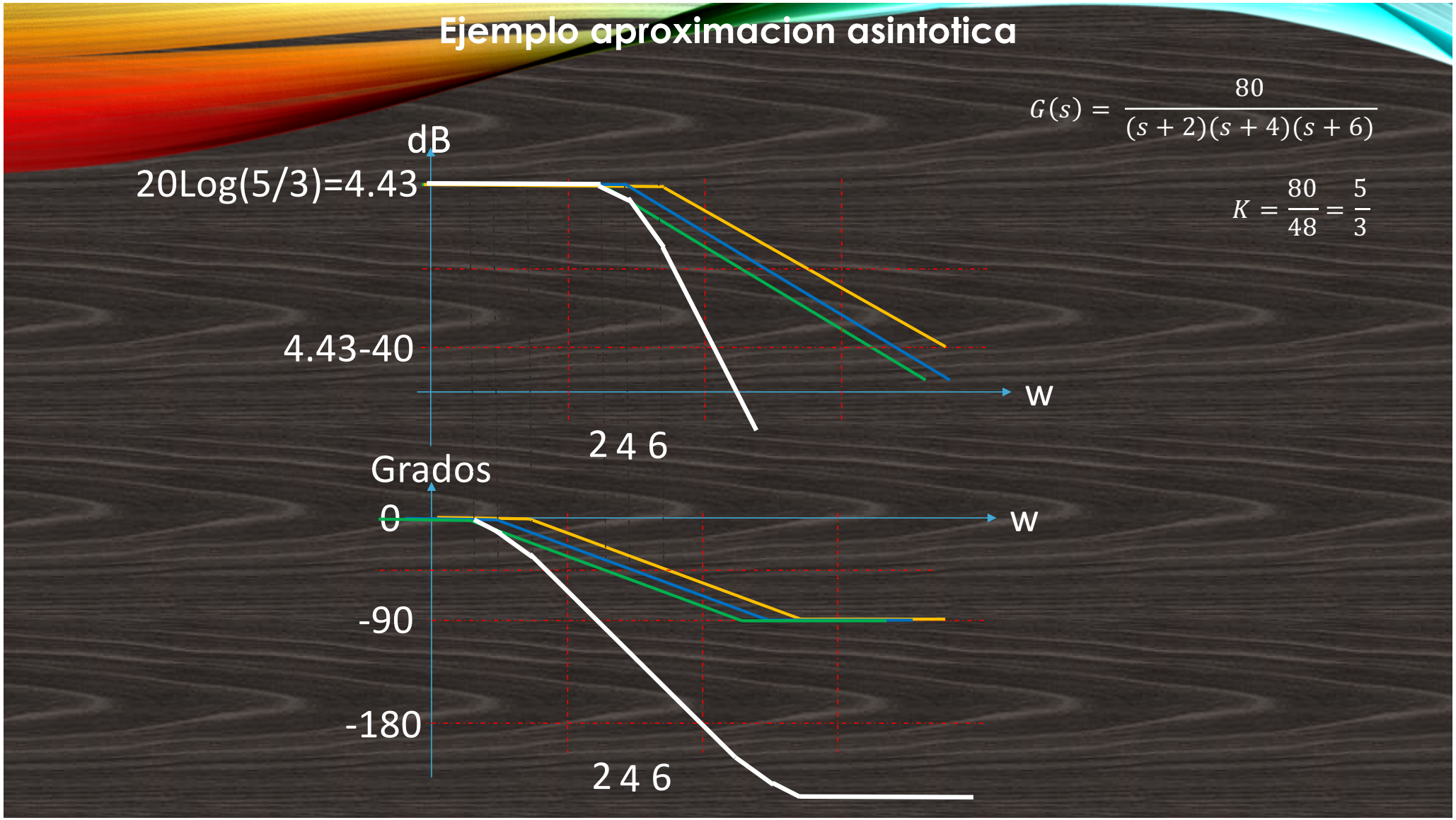


Sistema en lazo cerrado inestable

Ejemplo aproximacion asintotica

$$G(s) = \frac{80}{(s+2)(s+4)(s+6)}$$

$$K = \frac{80}{48} = \frac{5}{3}$$



Ejemplo Margen de fase y de ganancia

$$G(s) = \frac{80}{(s+2)(s+4)(s+6)}$$

$$G(jw) = \frac{80}{(jw+2)(jw+4)(jw+6)}$$

Para Margen de fase.

Se calcula w_f

$$\frac{80}{\sqrt{w_f^2+4}\sqrt{w_f^2+16}\sqrt{w_f^2+36}} = 1$$

$$w_f = 2\,rad/seg$$

Se calcula el margen de fase

$$\text{MF} = \text{Ang}\left(\frac{80}{(jw_f+2)(jw_f+4)(jw_f+6)}\right) - (-180°)$$

$$\text{MF} = -90° - (-180°) = 90°$$

Para Margen de ganancia.

Se calcula w_g

$$\text{Ang}\left(\frac{80}{(jw_g+2)(jw_g+4)(jw_g+6)}\right) = -180°$$

$$\text{Ang}\left(\frac{80}{(48-12w_g^2)+j(44w-w^3)}\right) = -180°$$

$$w_g = 2\sqrt{11}\,rad/seg$$

Se calcula el margen de ganancia

$$MG = 1 - \frac{80}{\sqrt{w_g^2+4}\sqrt{w_g^2+16}\sqrt{w_g^2+36}}$$

$$MG = 1 - \frac{1}{6} = \frac{5}{6}$$

Solo ayuda a verificar que es positivo

$$MG_{dB} = 0 - 20\log\left(\frac{1}{6}\right) = 20\log(6)$$

K= 6