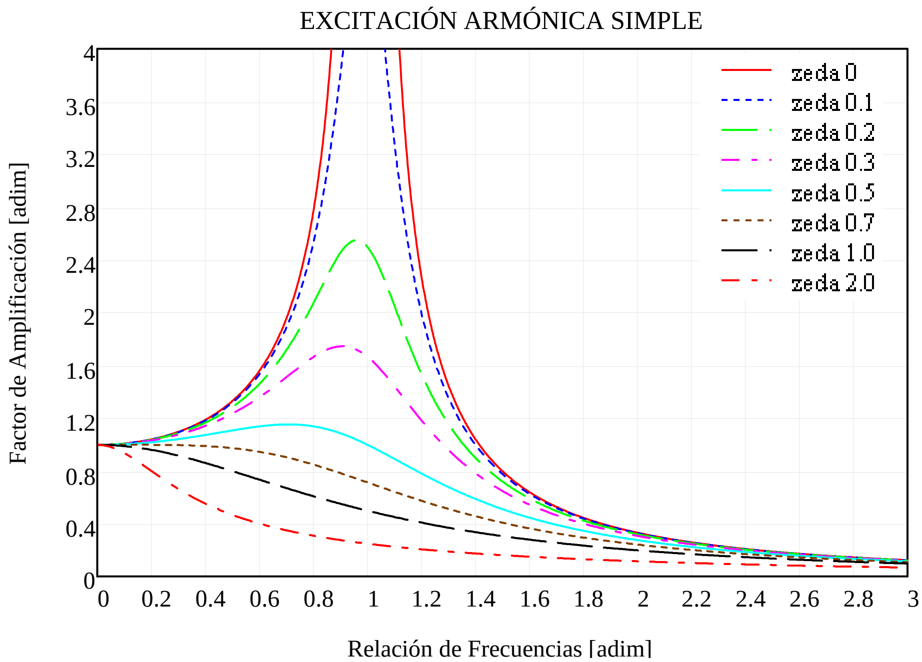
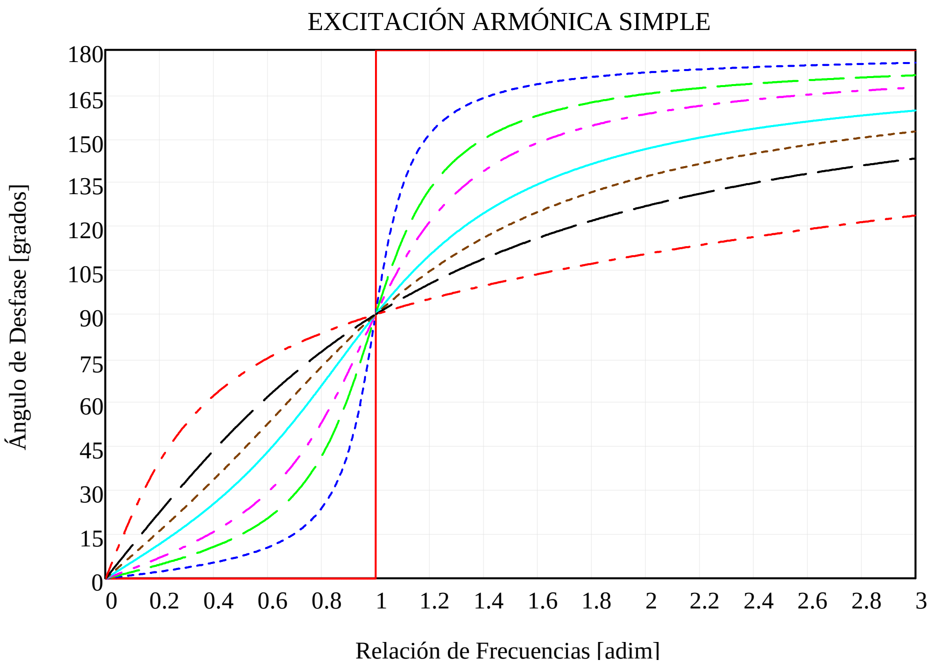


$$M_{eq}\cdot\frac{d^2}{dt^2}x(t) + C_{eq}\cdot\frac{d}{dt}x(t) + K_{eq}\cdot x(t) = F_0\cdot\cos(\Omega\cdot t)$$

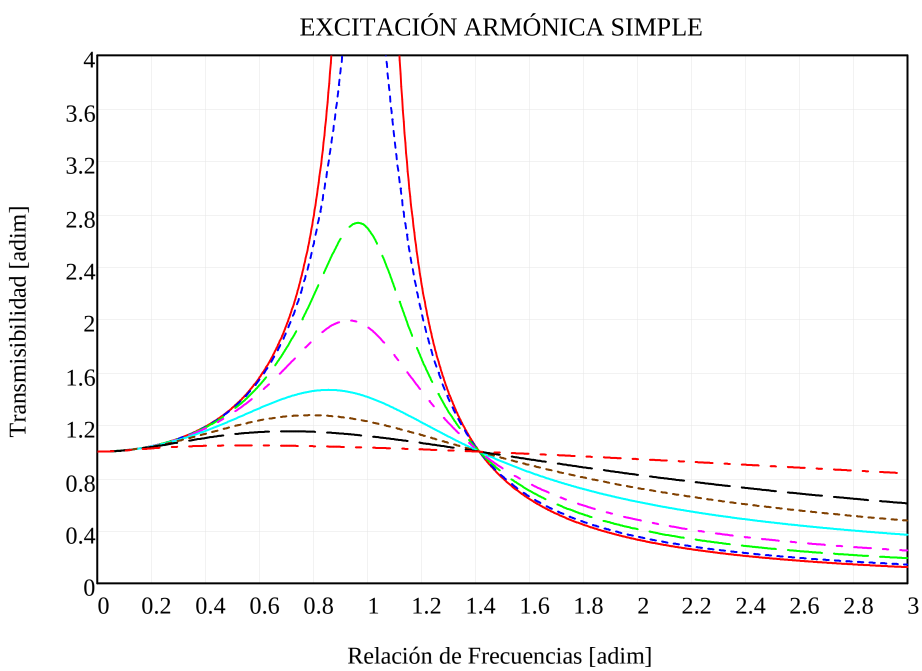
$$x_p(t) = \frac{F_0}{K_{eq}}\cdot FA(\zeta, r)\cdot\cos(\Omega\cdot t - \gamma)$$

$$FA(\zeta, r) = \frac{1}{\sqrt{\left(1 - r^2\right)^2 + (2\cdot\zeta\cdot r)^2}}$$

$$r_{crit}(\zeta) = \sqrt{1 - 2\cdot\zeta^2}$$



$$\gamma(\zeta, r) = \operatorname{atan}\left(\frac{2\cdot\zeta\cdot r}{1 - r^2}\right)$$

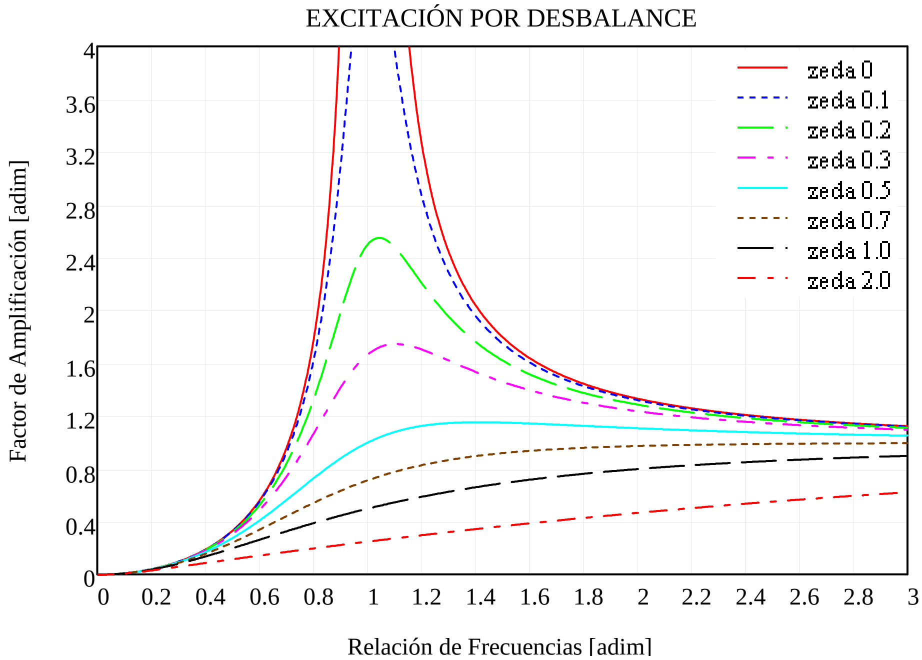


$$F_{T.d}(t) = F_0\cdot Tr(\zeta, r)\cdot\cos(\Omega\cdot t - \gamma + \alpha)$$

$$Tr(\zeta, r) = \frac{\sqrt{1 + (2\cdot\zeta\cdot r)^2}}{\sqrt{\left(1 - r^2\right)^2 + (2\cdot\zeta\cdot r)^2}}$$

$$r_{crit}(\zeta) = \frac{1}{2\cdot\zeta}\cdot\sqrt{\sqrt{1 + 8\cdot\zeta^2} - 1}$$

$$\alpha(\zeta, r) = \operatorname{atan}(2\cdot\zeta\cdot r)$$

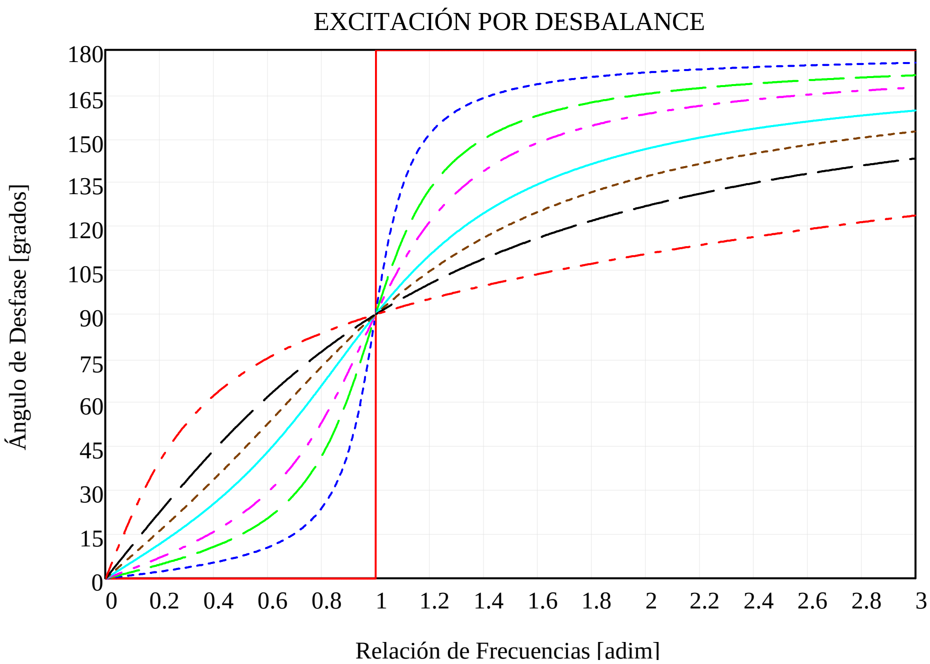


$$M_{eq}\cdot\frac{d^2}{dt^2}x(t) + C_{eq}\cdot\frac{d}{dt}x(t) + K_{eq}\cdot x(t) = m\cdot e\cdot\Omega^2\cdot\cos(\Omega\cdot t)$$

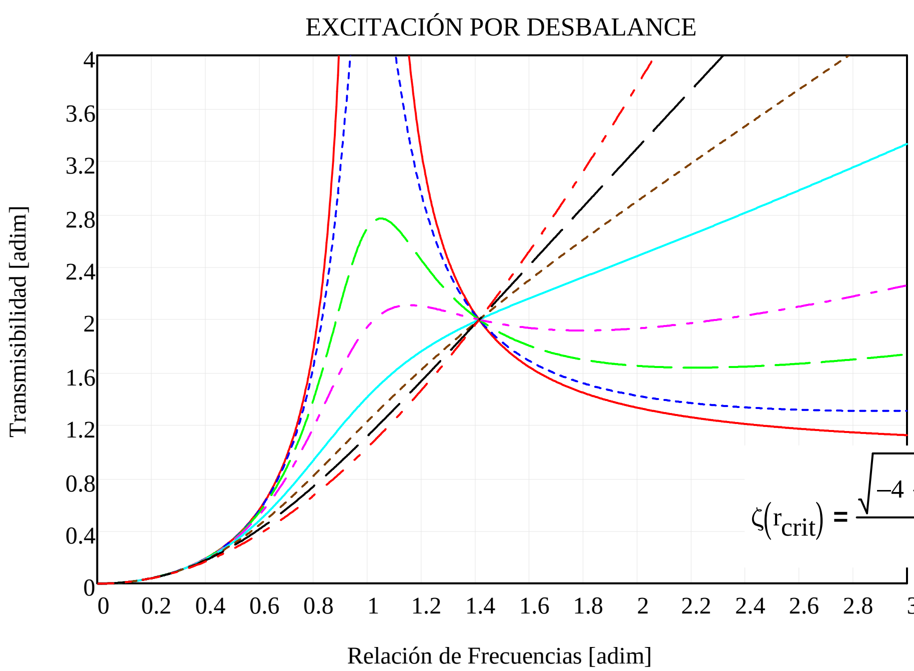
$$x_p(t) = \frac{m\cdot e}{M_{eq}}\cdot FA(\zeta,r)\cdot\cos(\Omega\cdot t - \gamma)$$

$$FA(\zeta,r) = \frac{r^2}{\sqrt{\left(1-r^2\right)^2 + (2\cdot\zeta\cdot r)^2}}$$

$$r_{crit}(\zeta) = \frac{1}{\sqrt{1-2\cdot\zeta^2}}$$



$$\gamma(\zeta,r) = \operatorname{atan}\left(\frac{2\cdot\zeta\cdot r}{1-r^2}\right)$$



$$F_{T.d}(t) = F_0\cdot Tr(\zeta,r)\cdot\cos(\Omega\cdot t - \gamma + \alpha)$$

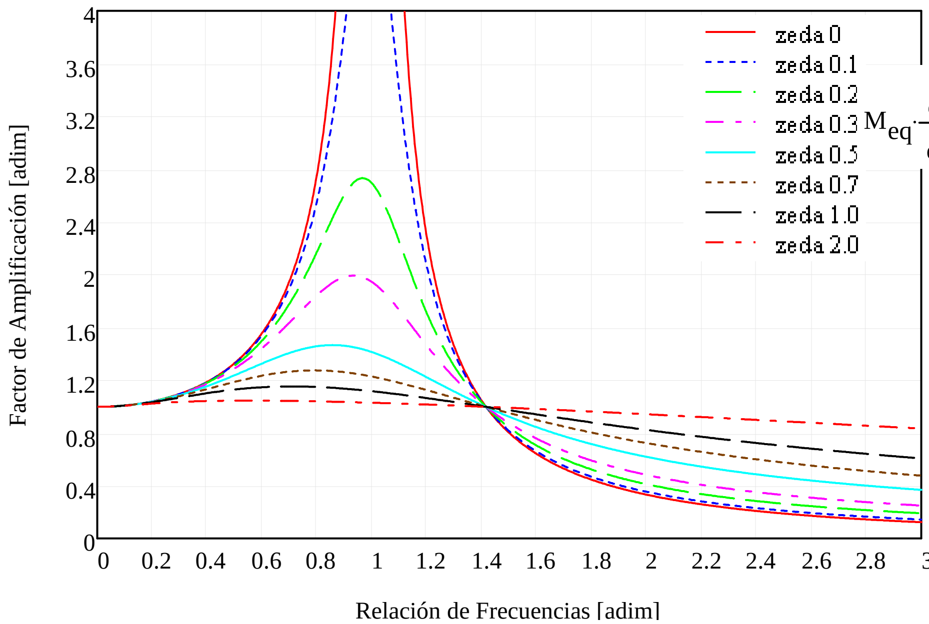
$$Tr(\zeta,r) = \frac{r^2\cdot\sqrt{1+(2\cdot\zeta\cdot r)^2}}{\sqrt{\left(1-r^2\right)^2 + (2\cdot\zeta\cdot r)^2}}$$

Para hallar r.crit, dado un ζ, se pude resolver numéricamente (e.g. tanteo) la siguiente ecuación:

$$\zeta\left(r_{crit}\right) = \frac{\sqrt{-4 + 4r_{crit}^2 - r_{crit}^4 + \sqrt{r_{crit}^8 - 8\cdot r_{crit}^6 + 24\cdot r_{crit}^4 - 16r_{crit}^2}}}{4r_{crit}}$$

$$\alpha(\zeta,r) = \operatorname{atan}(2\cdot\zeta\cdot r)$$

EXCITACIÓN POR MOV. EN LA BASE (RESPUESTA ABSOLUTA x(t))



$$z(t) = Z_0 \cdot \cos(\Omega \cdot t)$$

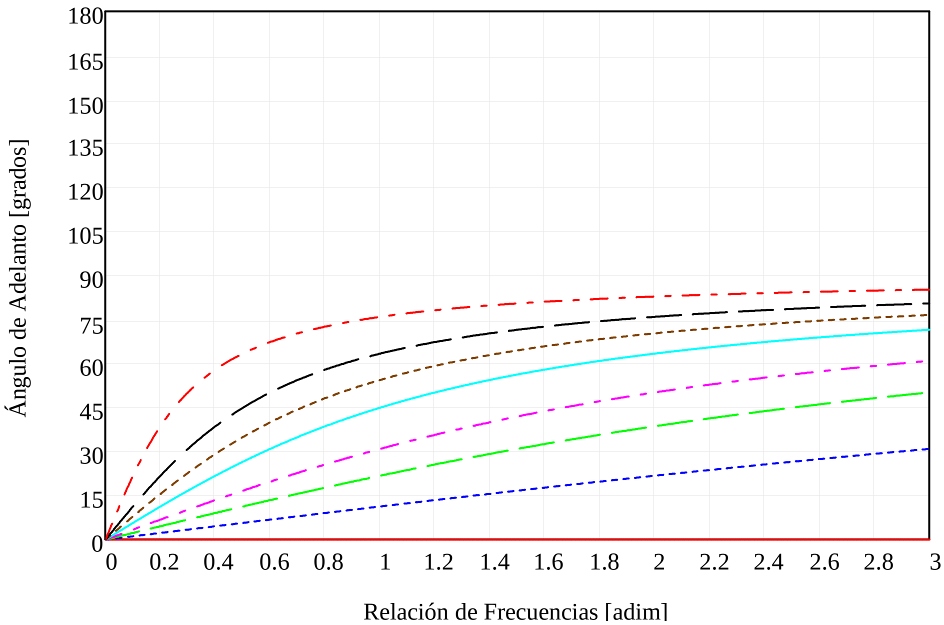
$$M_{eq} \cdot \frac{d^2}{dt^2} x(t) + C_{eq} \cdot \frac{d}{dt} x(t) + K_{eq} \cdot x(t) = K_{eq} \cdot z(t) + C_{eq} \cdot \frac{d}{dt} z(t)$$

$$x_p(t) = Z_0 \cdot FA(\zeta, r) \cdot \cos(\Omega \cdot t - \gamma + \alpha)$$

$$FA(\zeta, r) = \frac{\sqrt{1 + (2 \cdot \zeta \cdot r)^2}}{\sqrt{\left(1 - r^2\right)^2 + (2 \cdot \zeta \cdot r)^2}}$$

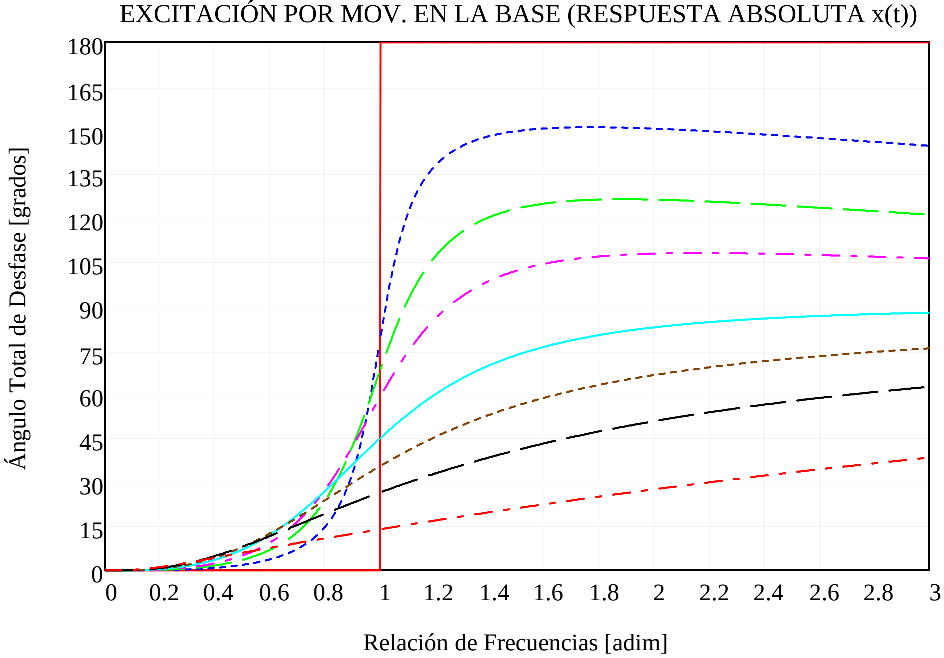
$$r_{crit}(\zeta) = \frac{1}{2 \cdot \zeta} \cdot \sqrt{\sqrt{1 + 8 \cdot \zeta^2} - 1}$$

EXCITACIÓN POR MOV. EN LA BASE (RESPUESTA ABSOLUTA x(t))

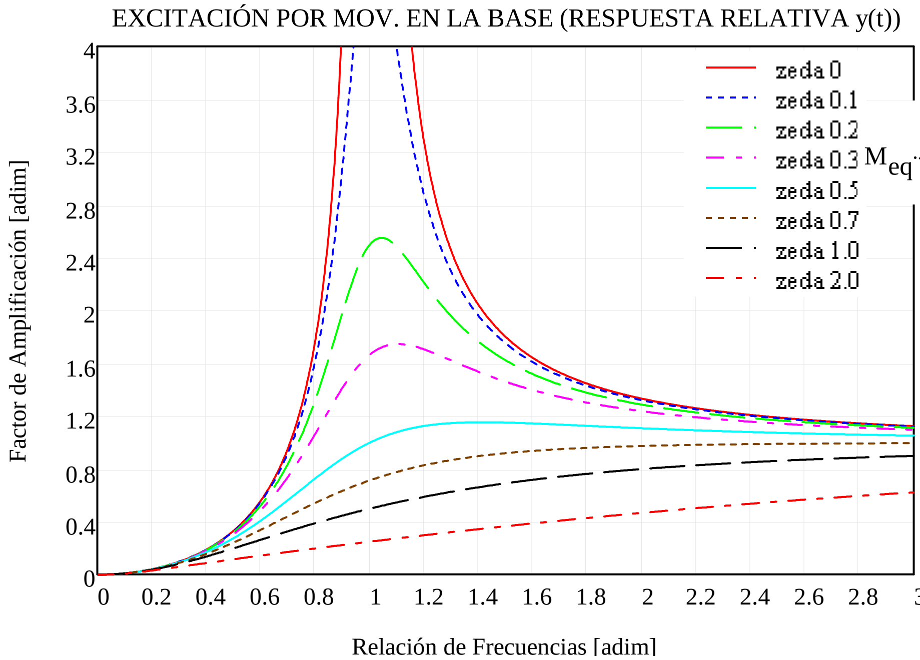


$$\alpha(\zeta, r) = \operatorname{atan}(2 \cdot \zeta \cdot r)$$

EXCITACIÓN POR MOV. EN LA BASE (RESPUESTA ABSOLUTA x(t))



$$\gamma(\zeta, r) - \alpha(\zeta, r) = \operatorname{atan}\left(\frac{2 \cdot \zeta \cdot r}{1 - r^2}\right) - \operatorname{atan}(2 \cdot \zeta \cdot r)$$



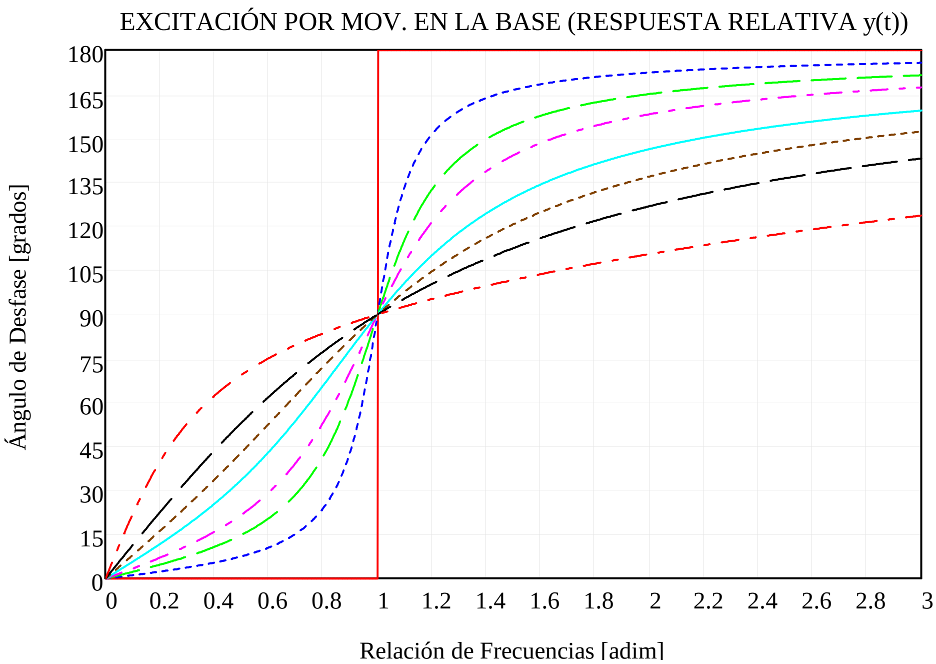
$$z(t) = Z_0 \cdot \cos(\Omega \cdot t)$$

$$M_{eq} \cdot \frac{d^2}{dt^2} y(t) + C_{eq} \cdot \frac{d}{dt} y(t) + K_{eq} \cdot y(t) = M_{eq} \cdot Z_0 \cdot \Omega^2 \cdot \cos(\Omega \cdot t)$$

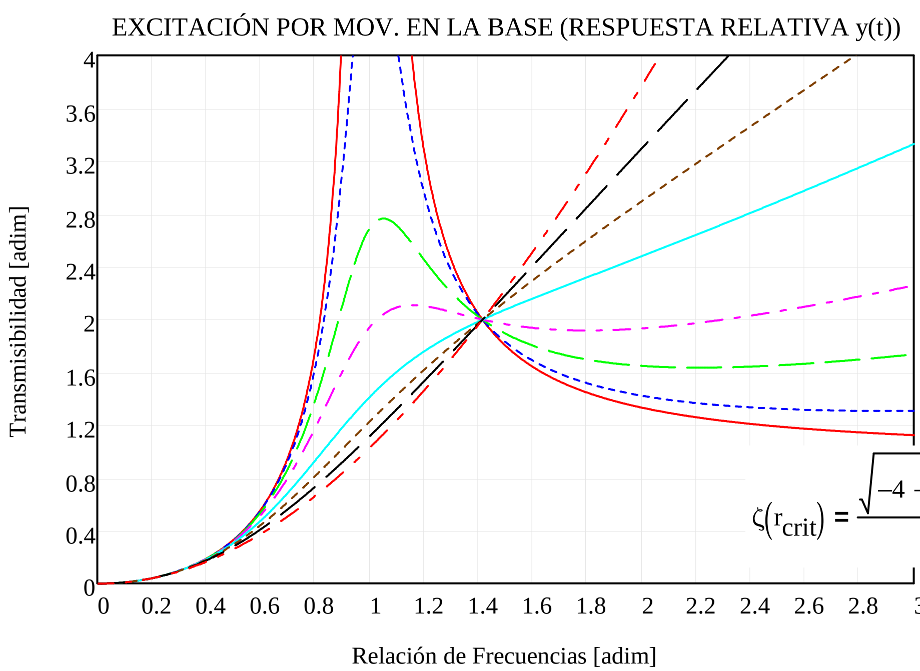
$$y_p(t) = Z_0 \cdot FA(\zeta, r) \cdot \cos(\Omega \cdot t - \gamma)$$

$$FA(\zeta, r) = \frac{r^2}{\sqrt{\left(1 - r^2\right)^2 + (2 \cdot \zeta \cdot r)^2}}$$

$$r_{crit}(\zeta) = \frac{1}{2 \cdot \zeta} \cdot \sqrt{\sqrt{1 + 8 \cdot \zeta^2} - 1}$$



$$\gamma(\zeta, r) = \operatorname{atan}\left(\frac{2 \cdot \zeta \cdot r}{1 - r^2}\right)$$



$$F_{T.d}(t) = Z_0 \cdot K_{eq} \cdot Tr(\zeta, r) \cdot \cos(\Omega \cdot t - \gamma + \alpha)$$

$$Tr(\zeta, r) = \frac{r^2 \cdot \sqrt{1 + (2 \cdot \zeta \cdot r)^2}}{\sqrt{\left(1 - r^2\right)^2 + (2 \cdot \zeta \cdot r)^2}}$$

Para hallar r.crit, dado un ζ, se pude resolver numéricamente (e.g. tanteo) la siguiente ecuación:

$$\zeta\left(r_{crit}\right) = \frac{\sqrt{-4 + 4r_{crit}^{\ 2} - r_{crit}^{\ 4} + \sqrt{r_{crit}^{\ 8} - 8 \cdot r_{crit}^{\ 6} + 24 \cdot r_{crit}^{\ 4} - 16r_{crit}^{\ 2}}}}{4r_{crit}}$$

$$\alpha(\zeta, r) = \operatorname{atan}(2 \cdot \zeta \cdot r)$$