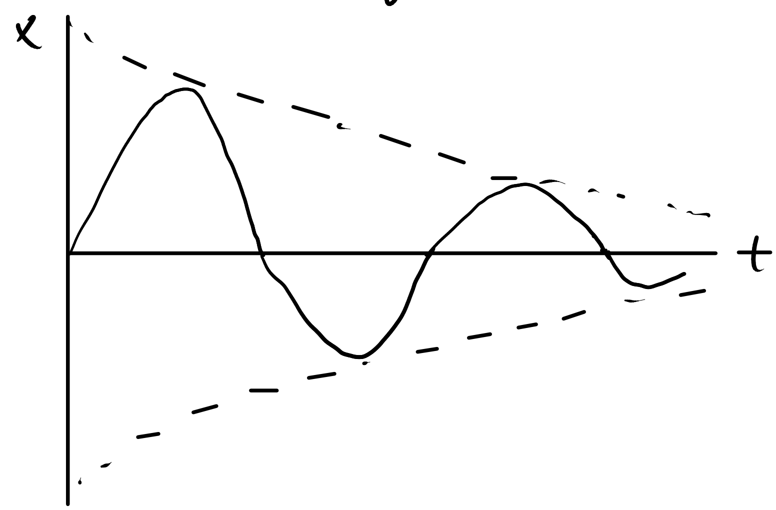
General Solution $x(t) = A e^{-\gamma t}\cos(\sqrt{\omega_0^2-\gamma^2}\, t) + B e^{-\gamma t}\sin(\sqrt{\omega_0^2-\gamma^2}\, t)$

or $x(t) = C e^{-\gamma t}\cos(\sqrt{\omega_0^2-\gamma^2}\, t - \alpha)$

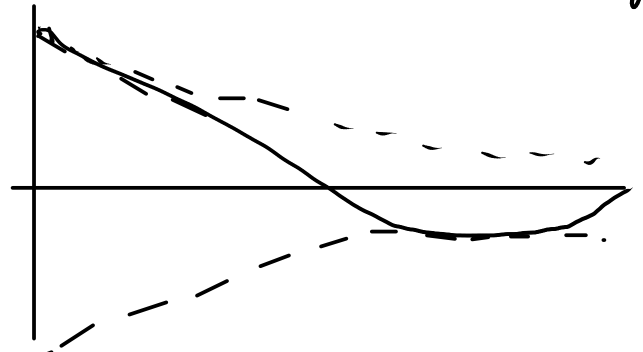
let $\omega = \sqrt{\omega_0^2 - \gamma^2}$ This is the new "frequency" <u>less than</u> the natural frequency.

The "Amplitude" $C e^{-\gamma t}$ decays in time

<u>Plot</u>



As $\gamma = \frac{c}{2m}$ get bigger, the frequency get lower



There is a <u>critical damping</u> coefficient where

$$\omega = \sqrt{\omega_0^2 - \gamma^2} = 0 \qquad \omega_0 = \gamma \quad \sqrt{\frac{k}{m}} = \frac{c}{2m}$$

That is $c^2 = 4km$