The **magnitude** of the complex velocity amplitude $\tilde{v}_o(\omega)$ of the microphone diaphragm is:

$$
\left|\tilde{v}_o(\omega)\right| \equiv \sqrt{v_{or}^2(\omega) + v_{oi}^2(\omega)} = \omega \left(\frac{p_o A_{dia}}{m_{dia}}\right) \frac{1}{\sqrt{\left(\omega_o^2 - \omega^2\right)^2 + \omega^2 \gamma_{dia}^2}}
$$

If we again define $x(\omega) = \omega/\omega_o$ and $y = \gamma_{dia}/\omega_o$ then we can rewrite the {normalized} magnitude of the complex velocity amplitude $\tilde{v}_o(\omega)$ and *v*-phase as:

$$
v\text{-Res}\left(x(\omega)\right) = \frac{\omega_o \left|\tilde{v}_o(\omega)\right|}{\left(\frac{p_o A_{dia}}{m_{dia}}\right)} = \frac{\left(\frac{\omega}{\omega_o}\right)}{\sqrt{\left[1-\left(\frac{\omega}{\omega_o}\right)^2\right]^2 + \left(\frac{\omega}{\omega_o}\right)^2 \left(\frac{\gamma_{dia}}{\omega_o}\right)^2}} = \frac{x}{\sqrt{\left(1-x^2\right)^2 + x^2y^2}}
$$

$$
\varphi_v(\omega) = \tan^{-1}\left(\frac{\left(\omega_o^2 - \omega^2\right)}{\omega\gamma_{dia}}\right) = \tan^{-1}\left(\frac{1-\left(\frac{\omega}{\omega_o}\right)^2}{\left(\frac{\omega}{\omega_o}\right)\left(\frac{\gamma_{dia}}{\omega_o}\right)}\right) = \tan^{-1}\left(\frac{1-x^2}{x\cdot y}\right)
$$

 We again have the usual three conditions of *underdamped*, *critically damped* and *overdamped* motion for $y = \gamma_{dia} / \omega_0 \ll 1$, $y = \gamma_{dia} / \omega_0 = 1$ and $y = \gamma_{dia} / \omega_0 \gg 1$, respectively. The following two color-coded figures show normalized *v*-Res(*x*) *vs*. *x* and *v*-Phase(*x*) *vs*. *x* for $y = 0.05$ (pink), 1.0 (cyan) and 10.0 (violet):

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