Since all forces act along/against the same direction (*i.e.* the $\hat{n}$-axis = the outward pointing normal to the plane of the microphone diaphragm), then using the relations:

$$\vec{\tilde{v}}_{dia}(t) = \partial \vec{\tilde{x}}_{dia}(t)/\partial t \equiv \dot{\vec{\tilde{x}}}_{dia}(t) \text{ and: } \vec{\tilde{a}}_{dia}(t) = \partial \vec{\tilde{v}}_{dia}(t)/\partial t = \partial^2 \vec{\tilde{x}}_{dia}(t)/\partial t^2 \equiv \ddot{\vec{\tilde{x}}}_{dia}(t),$$

and dropping the vector arrows, we arrive at the 2nd order ***inhomogeneous*** differential equation of 1-D motion of the microphone diaphragm:

$$m_{dia}\ddot{\tilde{x}}_{dia}(t) + m_{dia}\gamma_{dia}\dot{\tilde{x}}_{dia}(t) + k_{dia}\tilde{x}_{dia}(t) = \tilde{p}(t)A_{dia}$$

The general solution to this equation for steady-state driven harmonic motion of the diaphragm is of the form $\tilde{x}_{dia}(t) = \tilde{x}_o(\omega)e^{i\omega t}$. For un-damped, non-driven (*i.e.* $\gamma_{dia} = 0$ and $\tilde{p}(t) = 0$) steady-state motion of the diaphragm, the natural resonant angular frequency is $\omega_o \equiv \sqrt{k_{dia}/m_{dia}}$. For damped and driven steady-state harmonic motion (*i.e.* $\gamma_{dia} \neq 0$ and $\tilde{p}(t) = p_o e^{i\omega t} \neq 0$):

$$-\omega^2 m_{dia}\tilde{x}_o(\omega)\cancel{e^{i\omega t}} + i\omega m_{dia}\gamma_{dia}\tilde{x}_o(\omega)\cancel{e^{i\omega t}} + k_{dia}\tilde{x}_o(\omega)\cancel{e^{i\omega t}} = p_o\cancel{e^{i\omega t}}A_{dia}$$

or:

$$\left[-\omega^2 m_{dia} + i\omega m_{dia}\gamma_{dia} + k_{dia}\right]\tilde{x}_o(\omega) = p_o A_{dia}$$

Dividing though by m_{dia}: $\left[-\omega^2 + i\omega\gamma_{dia} + (k_{dia}/m_{dia})\right]\tilde{x}_o(\omega) = p_o A_{dia}/m_{dia}$

Using the natural angular resonant frequency relation $\omega_o^2 \equiv (k_{dia}/m_{dia})$:

$$\left[-\omega^2 + i\omega\gamma_{dia} + \omega_o^2\right]\tilde{x}_o(\omega) = p_o A_{dia}/m_{dia}$$

or:

$$\tilde{x}_o(\omega) = \left(\frac{p_o A_{dia}}{m_{dia}}\right)\frac{1}{\left[(\omega_o^2 - \omega^2) + i\omega\gamma_{dia}\right]} = \left(\frac{p_o A_{dia}}{m_{dia}}\right)\frac{1}{\left[(\omega_o^2 - \omega^2) + i\omega\gamma_{dia}\right]}\cdot\frac{\left[(\omega_o^2 - \omega^2) - i\omega\gamma_{dia}\right]}{\left[(\omega_o^2 - \omega^2) - i\omega\gamma_{dia}\right]}$$

$$= \left(\frac{p_o A_{dia}}{m_{dia}}\right)\frac{\left[(\omega_o^2 - \omega^2) - i\omega\gamma_{dia}\right]}{(\omega_o^2 - \omega^2)^2 + \omega^2\gamma_{dia}^2}$$

The ***real/in-phase component*** of the complex displacement amplitude $\tilde{x}_o(\omega)$ of the microphone diaphragm is:

$$x_{or}(\omega) \equiv \text{Re}\{\tilde{x}_o(\omega)\} = \left(\frac{p_o A_{dia}}{m_{dia}}\right)\frac{(\omega_o^2 - \omega^2)}{(\omega_o^2 - \omega^2)^2 + \omega^2\gamma_{dia}^2}$$

The ***imaginary/quadrature component*** of the complex displacement amplitude $\tilde{x}_o(\omega)$ of the microphone diaphragm is:

$$x_{oi}(\omega) \equiv \text{Im}\{\tilde{x}_o(\omega)\} = -\left(\frac{p_o A_{dia}}{m_{dia}}\right)\frac{\omega\gamma_{dia}}{(\omega_o^2 - \omega^2)^2 + \omega^2\gamma_{dia}^2}$$