$$\angle H(\omega) = -\arctan\left(\frac{2h\dfrac{\omega}{\omega_0}}{1-\dfrac{\omega^2}{\omega_0^2}}\right) = -\arctan\left(\frac{2h\omega_0\cdot\omega}{\omega_0^2-\omega^2}\right) = -\arctan\left(f(\omega)\right)$$

$$\phi(\omega) = \frac{d\left[\angle H(\omega)\right]}{d\omega} = -\frac{d\left[\arctan(f)\right]}{df}\frac{df}{d\omega} = -\frac{1}{1+f^2(\omega)}\cdot\frac{df}{d\omega}$$

$$\Rightarrow \phi(\omega) = -\frac{1}{1+\left(\dfrac{2h\omega_0\cdot\omega}{\omega_0^2-\omega^2}\right)^2}\cdot\frac{2h\omega_0\left(\omega_0^2-\omega^2\right)-2h\omega_0\cdot\omega(-2\omega)}{\left(\omega_0^2-\omega^2\right)^2}$$

$$\Rightarrow \phi(\omega) = -\frac{\left(\omega_0^2-\omega^2\right)^2}{\left(\omega_0^2-\omega^2\right)^2+\left(2h\omega_0\cdot\omega\right)^2}\cdot\frac{2h\omega_0\left(\omega_0^2-\omega^2+2\omega^2\right)}{\left(\omega_0^2-\omega^2\right)^2}$$

$$\Rightarrow \phi(\omega) = -\frac{1}{\left(\omega_0^2-\omega^2\right)^2+\left(2h\omega_0\cdot\omega\right)^2}\cdot 2h\omega_0\left(\omega_0^2+\omega^2\right)$$

$$\Rightarrow \phi(\omega=\omega_0) = -\frac{1}{\left(2h\omega_0^2\right)^2}\cdot 4h\omega_0^3$$

$$\Rightarrow \phi(\omega=\omega_0) = -\frac{1}{h\omega_0} \Leftrightarrow h = -\frac{1}{\omega_0\cdot\phi(\omega_0)}$$

$$\Rightarrow \phi(\omega=\omega_0) = -\frac{1}{h\omega_0} \Leftrightarrow h = -\frac{1}{\omega_0\phi(\omega_0)}$$