Accelerometer Frequency Response

$$x_i(t) = X_i \sin(\omega t) \tag{9.65}$$

$$x_r(t) = X_r \sin(\omega t + \phi) \tag{9.66}$$

$$\frac{X_r}{X_i} = \frac{(\omega/\omega_n)^2}{\left(\left[1-\left(\frac{\omega}{\omega_n}\right)^2\right]^2 + 4\zeta^2\left(\frac{\omega}{\omega_n}\right)^2\right)^{1/2}} \tag{9.67}$$

$$\phi = -\tan^{-1}\left(\frac{2\zeta(\omega/\omega_n)}{1-\left(\frac{\omega}{\omega_n}\right)^2}\right) \tag{9.68}$$

$$\ddot{x}_i(t) = -X_i\omega^2 \sin(\omega t) \tag{9.69}$$

$$X_i\omega^2 \tag{9.70}$$

$$H_a(\omega) = \frac{X_r\omega_n^2}{X_i\omega^2} = \frac{1}{\left(\left[1-\left(\frac{\omega}{\omega_n}\right)^2\right]^2 + 4\zeta^2\left(\frac{\omega}{\omega_n}\right)^2\right)^{1/2}} \tag{9.71}$$

$$X_r = \left(\frac{1}{\omega_n^2}\right) H_a(\omega)(X_i\omega^2) \tag{9.72}$$

$$(X_i\omega^2) = \frac{X_r\omega_n^2}{H_a(\omega)} \tag{9.73}$$

$$(X_i\omega^2) = (\omega_n^2)X_r \tag{9.74}$$

$$\ddot{x}_i(t) = \omega_n^2 x_r(t) \tag{9.75}$$