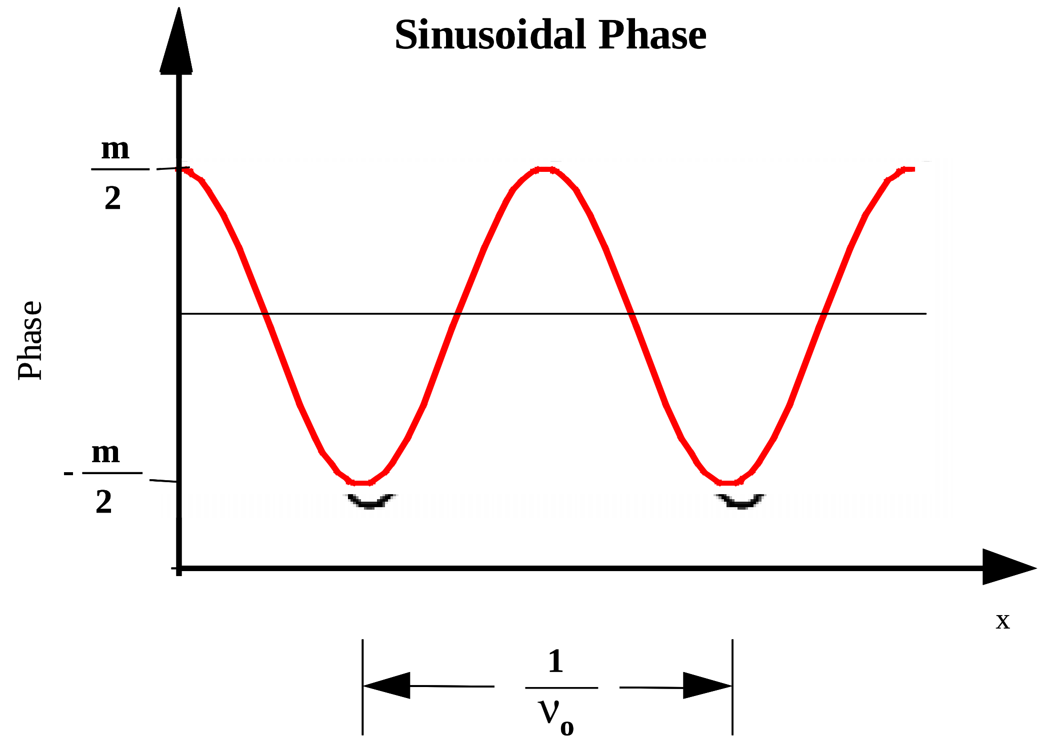
Sinusoidal Phase Grating

Amplitude transmission

$t_A = e^{i \left(\frac{m}{2}\right) \mathrm{Sin}[2 \pi \nu_o x]};$



Identity

$$e^{i \left(\frac{m}{2}\right) \mathrm{Sin}[2 \pi \nu_o x]} = \sum_{q=-\infty}^{\infty} J_q\left[\frac{m}{2}\right] e^{i 2 \pi q \nu_o x}$$

We will assume an infinite sized aperture since the only effect of a finite sized aperture is to convolve the spectrum with the Fourier transform of the aperture.

Spectrum

$$\mathrm{fourierTransform}[t_A] = \sum_{q=-\infty}^{\infty} J_q\left[\frac{m}{2}\right] \delta(\nu_x - q \nu_o, \ \nu_y)$$

■ DiffractionEfficiency

In general there are many diffraction orders and the amount of light in the qth order as a function of the peak-valley phase amplitude, m, of the grating is given by

$$\texttt{diffractionEfficiency[q\_, m\_] := BesselJ}\left[q, \frac{m}{2}\right]^2$$