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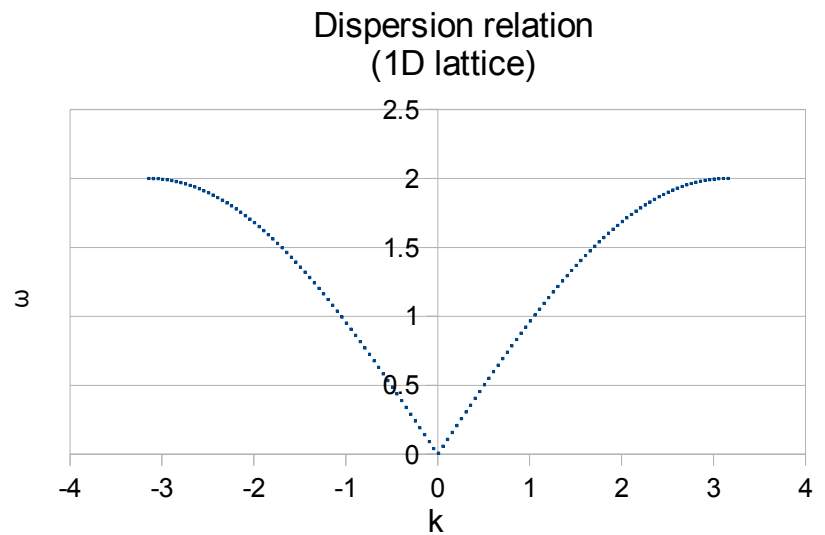
Dispersion Relation

Homework – Computational Experimental Science

1. Draw the dispersion relation

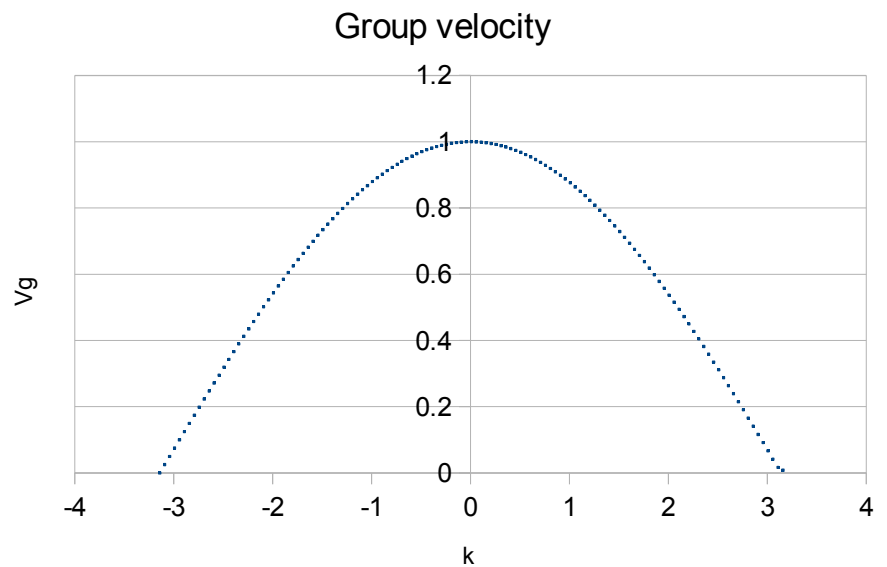
$$\omega = 2\sqrt{\frac{C}{m}} \left| \sin \frac{ka}{2} \right|$$

using $C = m = a = 1$ for $\frac{\pi}{a} \leq k \leq \frac{\pi}{a}$



2. Draw the graph for $v_g \left(\frac{d\omega}{dk} \right)$

$$v_g = 2\sqrt{\frac{C}{m}} \left| \frac{a}{2} \cos \frac{ka}{2} \right|$$



3. Draw the density of state

$$D(\omega) = \frac{1}{L^{\alpha=1}} \frac{dN}{d\omega} = \frac{1}{L} \frac{dN}{dK} \frac{dK}{d\omega} = \frac{1}{\pi} \frac{1}{d\omega/dK}$$

$$D(\omega) = \frac{1}{\pi v_g(\omega)} = \left[\pi a \sqrt{\frac{g}{m}} \cos\left(\frac{1}{2} K(\omega) a\right) \right]^{-1}$$

* singularity on $k = \frac{\pi}{a}$

