1) For electrons, the bandstructure is a plot of energy, \( E(\vec{k}) \), vs. wavevector, \( \vec{k} \). For phonons, the dispersion is a plot of phonon energy, \( \hbar \omega(\vec{q}) \), vs. phonon wavevector, \( \vec{q} \). For electrons, we often approximate the bandstructure with simple, parabolic bands,

\[
E(\vec{k}) = \frac{\hbar^2 k^2}{2m}
\]

For phonons, we can sometimes approximate the phonon dispersion with the Debye approximation,

\[
\hbar \omega = \hbar \nu_D \vec{q},
\]

where \( \nu_D \) is the Debye velocity (an average of the longitudinal and transverse acoustic velocities.)

1a) Compute the density-of-states, \( D_{ph}(\hbar \omega) \), for phonons in the Debye model.

1b) Compute the distribution of channels, \( M_{ph}(\hbar \omega) \), for phonons in the Debye model.