6.1 The multiplicity of an Einstein solid is given by equation 2.9

\[
\Omega(N, q) = \binom{q + N - 1}{q} = \frac{(q + N - 1)!}{q! (N - 1)!}
\]

For an Einstein solid we have \( N = 1 \), for the other ("the reservoir") we can have \( N = 100 \). Let's set up a spreadsheet to do the calculation. (See next page for graph and spreadsheet).

Since we are plotting total multiplicity of an isolated system, the most probable state is the one with the largest multiplicity, namely the one with \( q_1 = 0 \). The rest of the shape should be described (approximately) by the Boltzmann factor \( P(E) = P(0) e^{-E/kT} \). Since \( E \propto q \), this shape is explained as well.

Finally, we look at \( \ln R_{\text{total}} \). If \( R_{\text{total}} \propto e^{E/kT} \), then \( \ln R_{\text{total}} \propto -E/kT \). The nearly linear shape expresses the fact that \( E \propto q \).
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