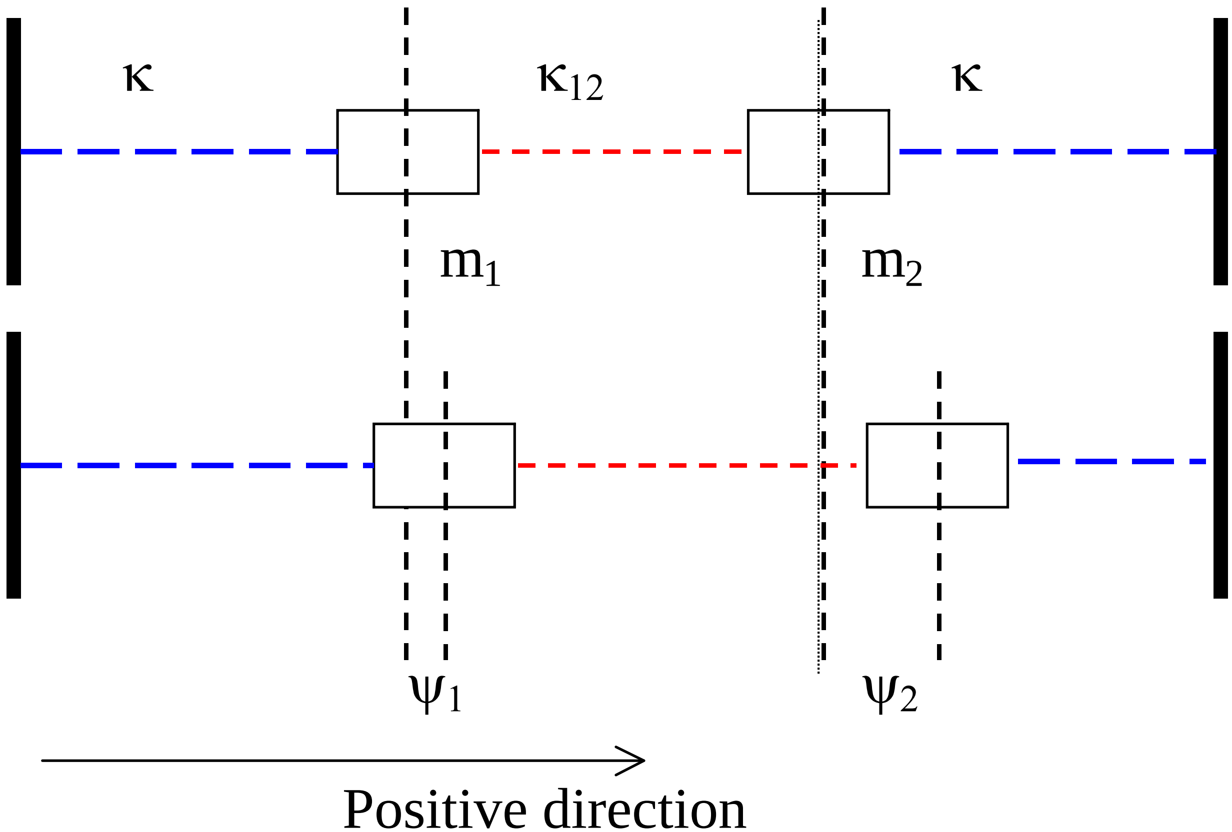
Two Masses Connected to Hooke's Law Springs

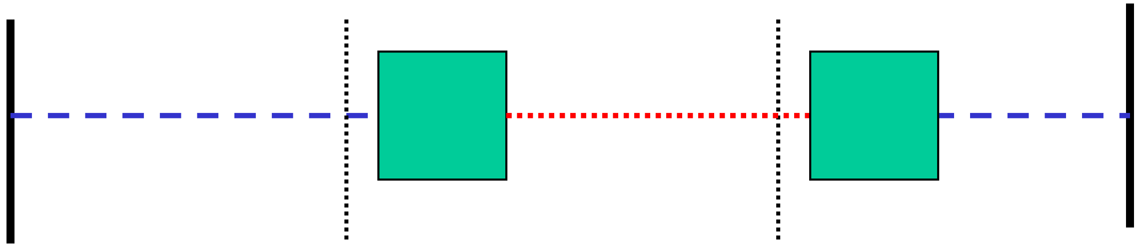


Force on m_1: $F_1 = -\kappa\psi_1 + \kappa_{12}(\psi_2 - \psi_1)$

Force on m_2: $F_2 = -\kappa\psi_2 + \kappa_{12}(\psi_1 - \psi_2)$

Low frequency mode: $\omega_{low} = \sqrt{\frac{\kappa}{m}}$

Symmetric mode: $A_1 = A_2$

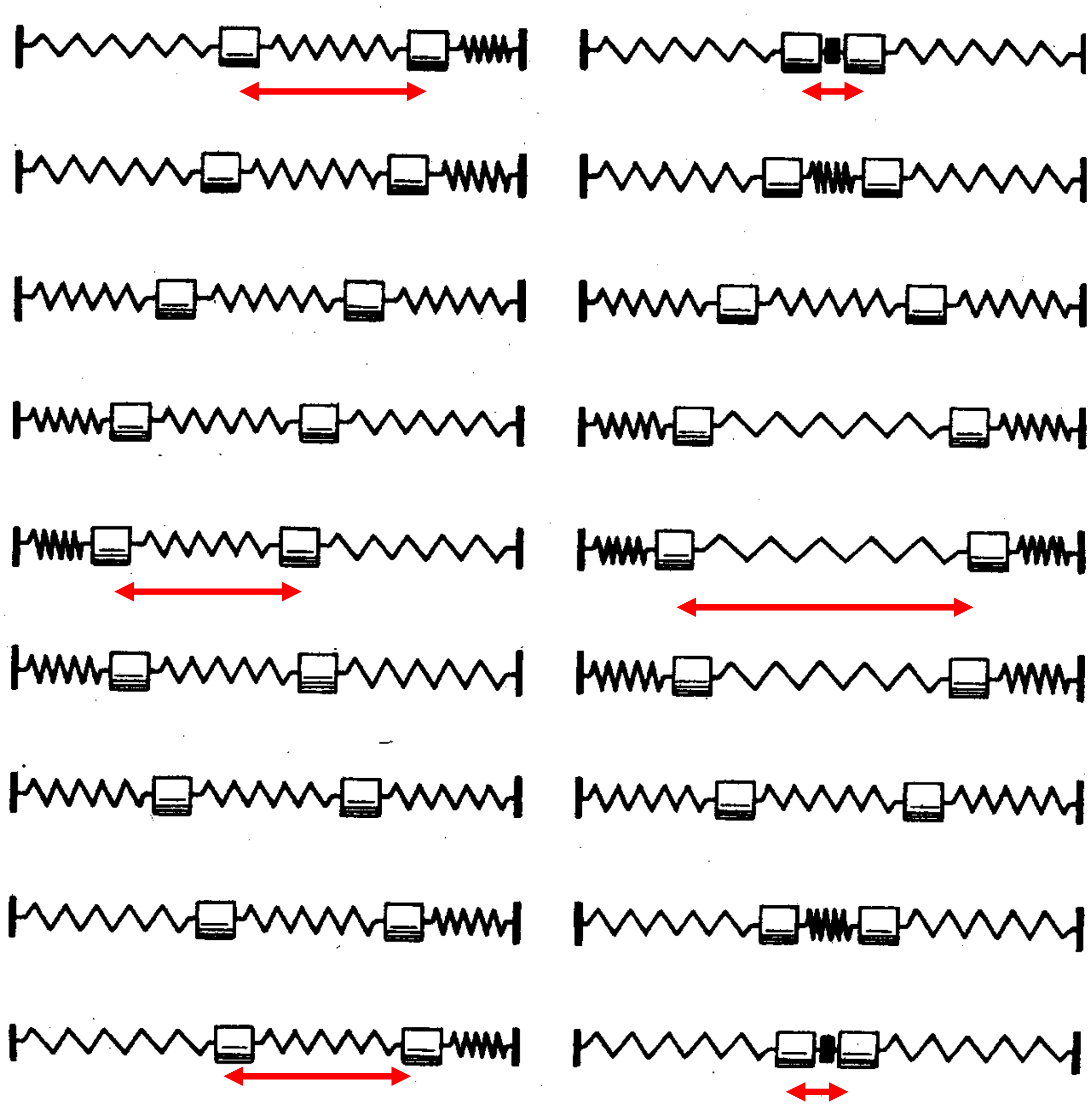


High frequency mode: $\omega_{high} = \sqrt{\frac{\kappa + 2\kappa_{12}}{m}}$

Antisymmetric mode: $A_1 = - A_2$

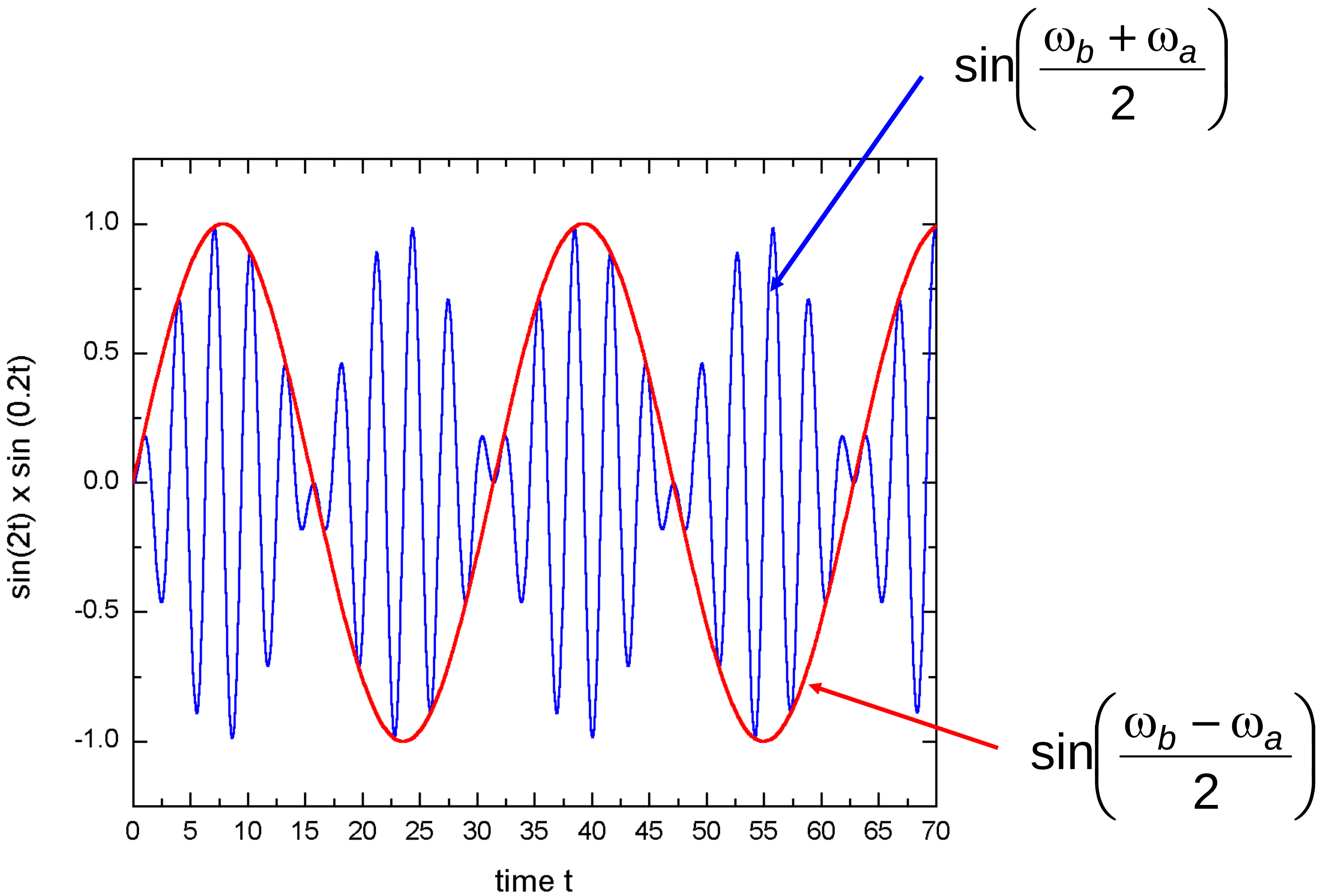
symmetric mode
(low frequency)

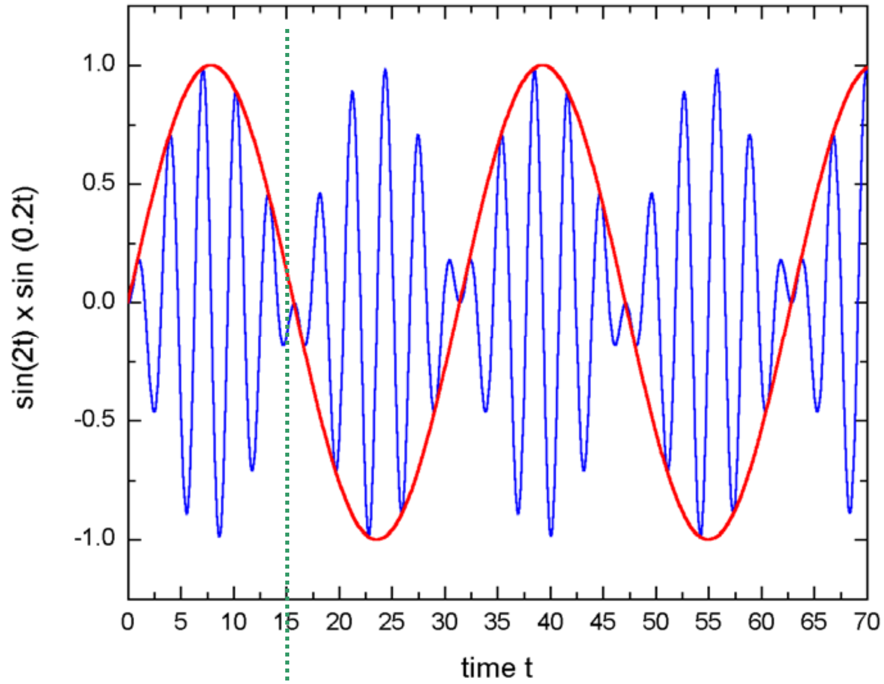
anti-symmetric mode
(high frequency)



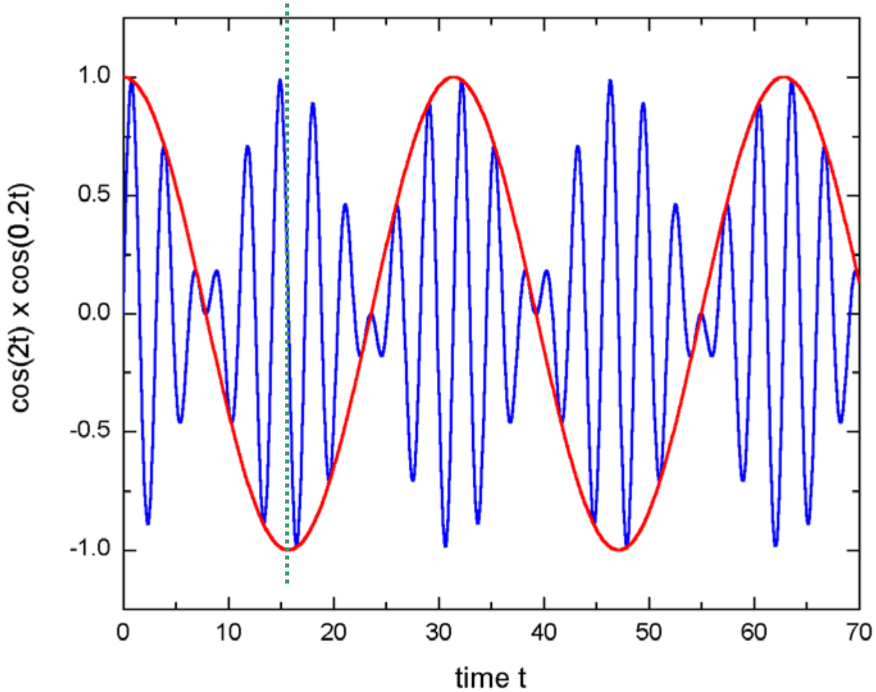
From Fig. 8.3, I. G. Main, *Vibrations and Waves in Physics*

“Beats” in Motion of Coupled Oscillator



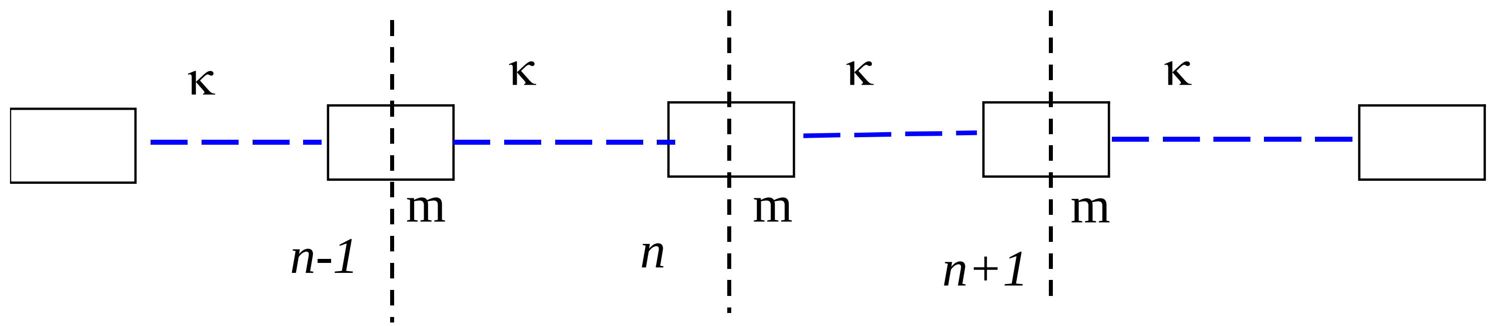

sin(2t) x sin (0.2t)
1.0
0.5
0.0
-0.5
-1.0
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70
time t

ψ_1

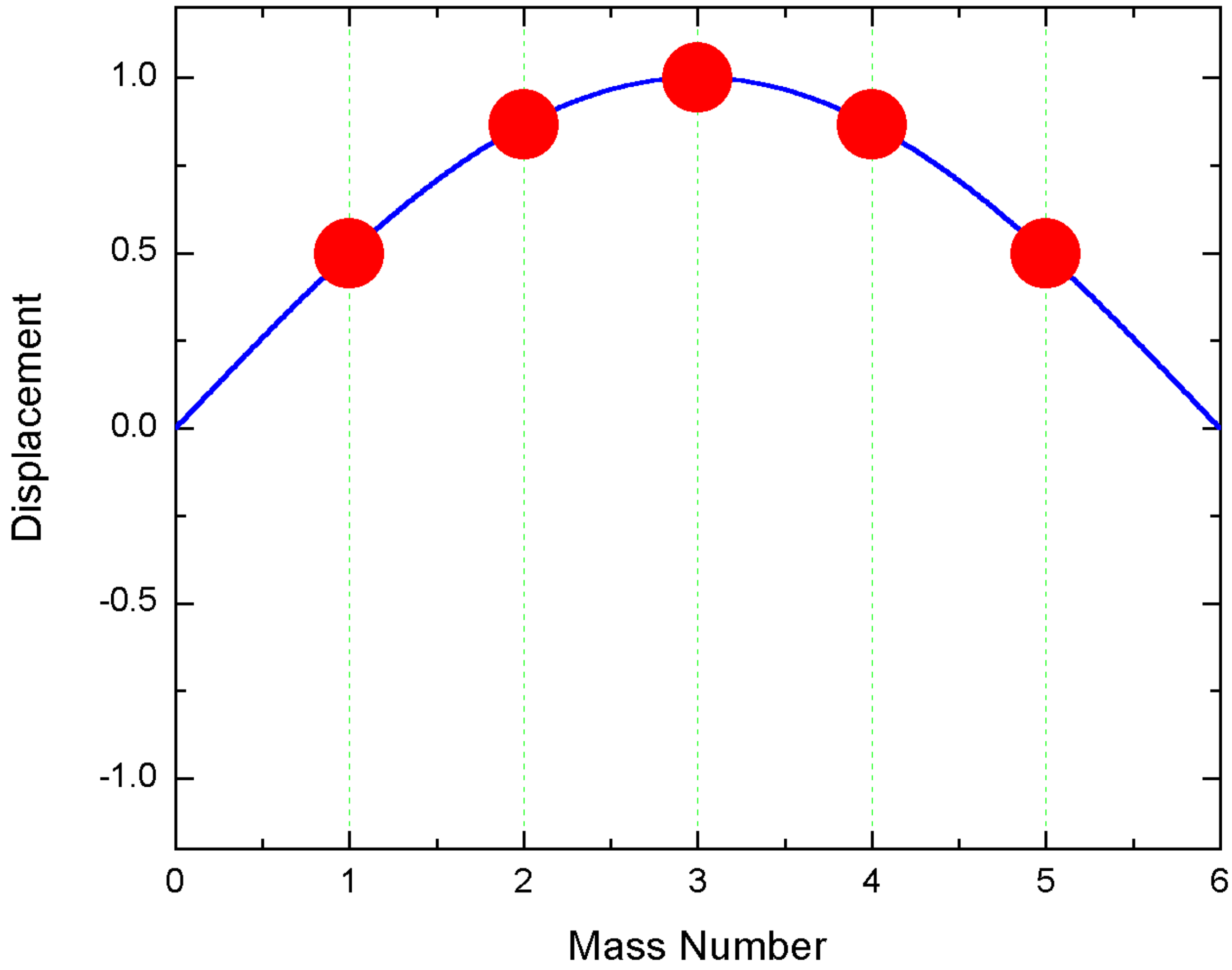

cos(2t) x cos(0.2t)
1.0
0.5
0.0
-0.5
-1.0
0 10 20 30 40 50 60 70
time t

ψ_2

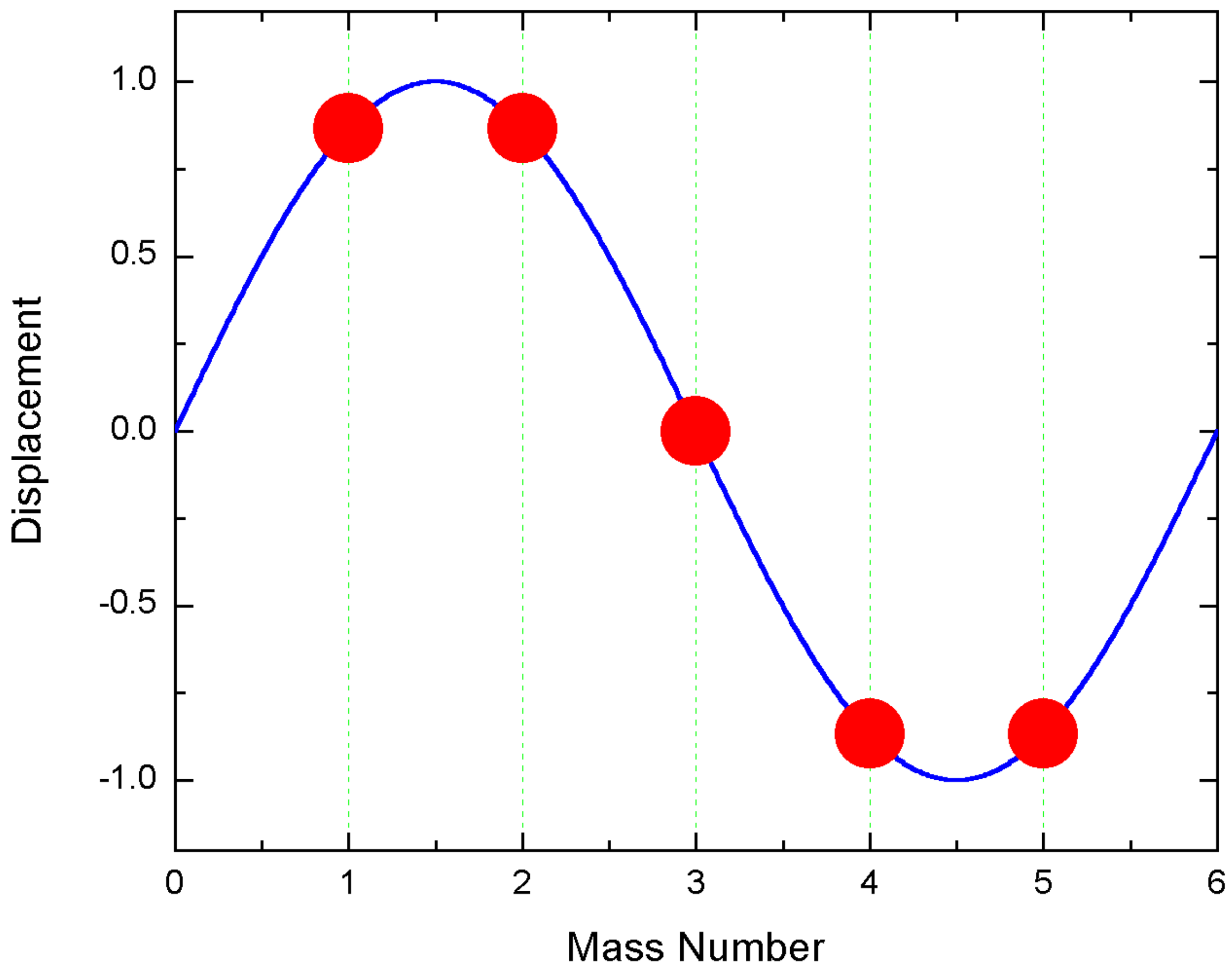
Chain of Many (*N*) Spring-Coupled Masses



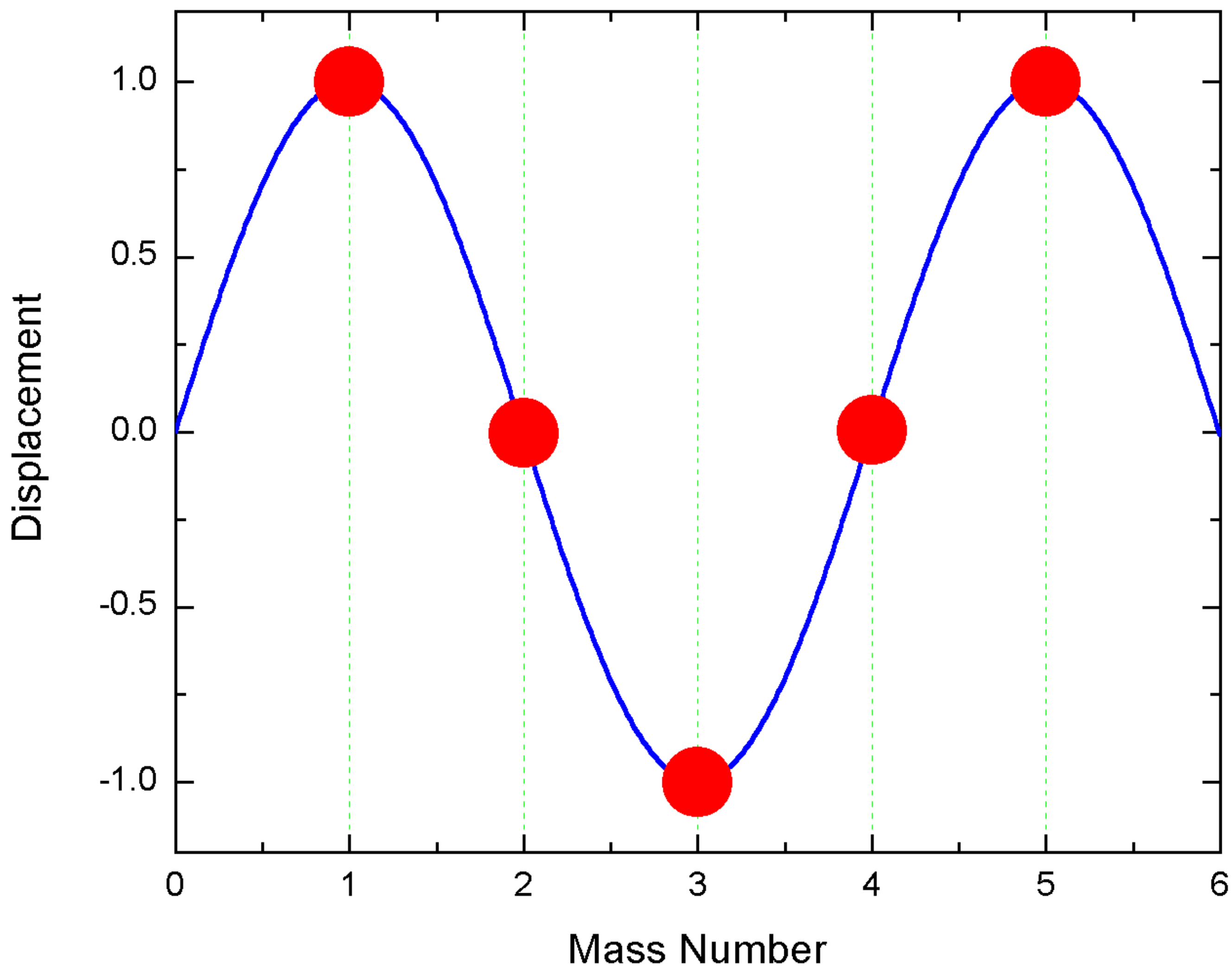
5 Mass Chain – Mode 1



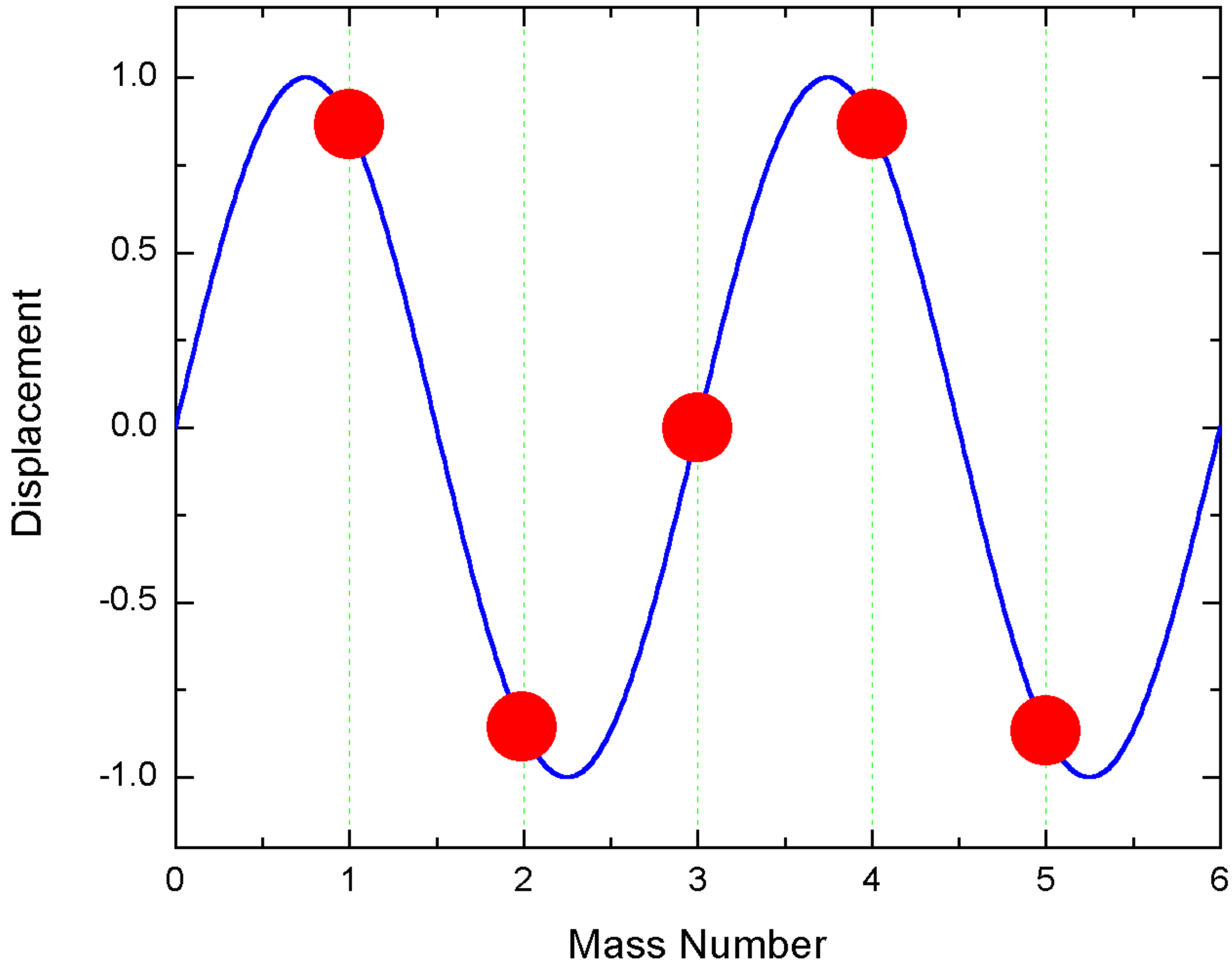
5 Mass Chain – Mode 2



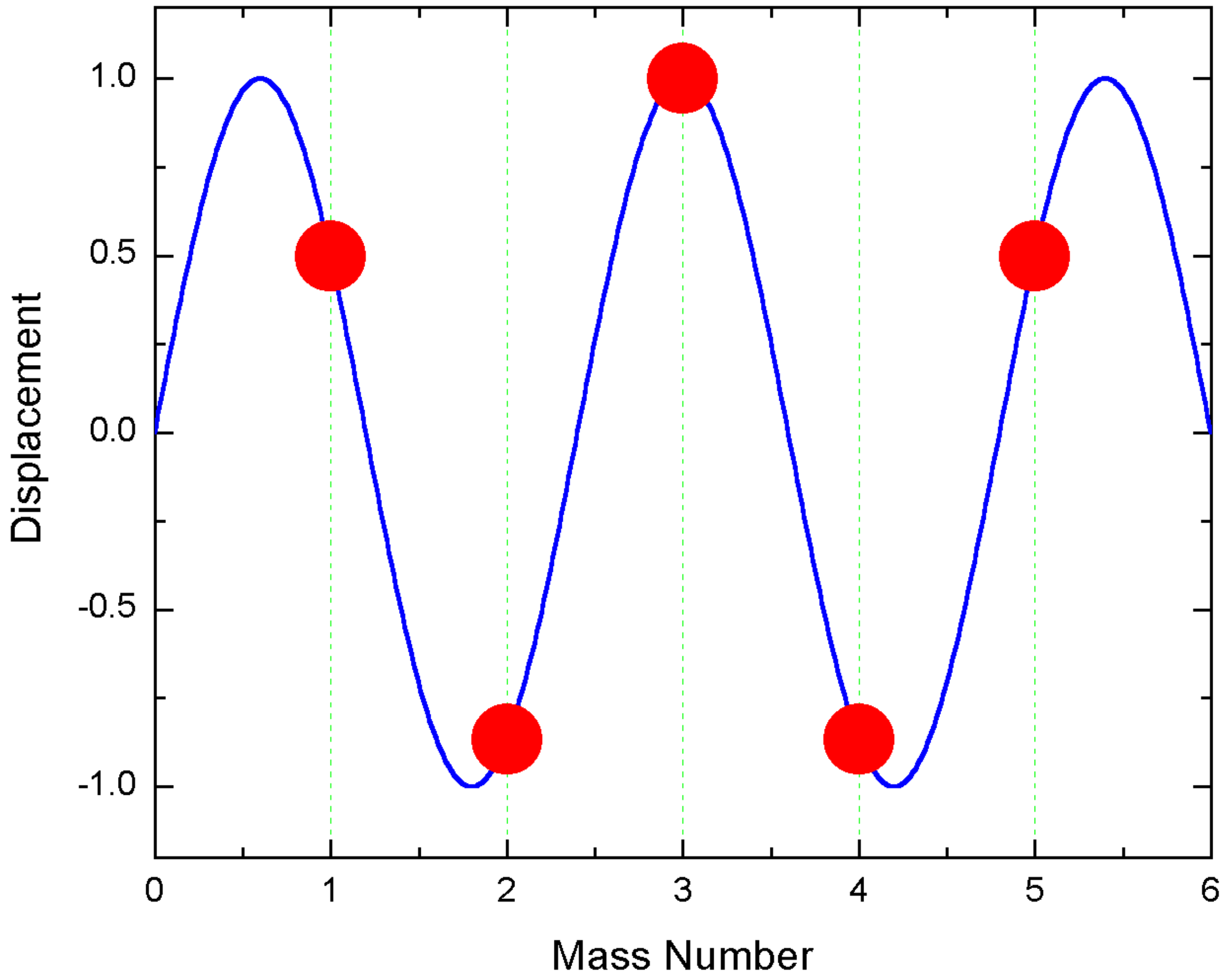
5 Mass Chain – Mode 3



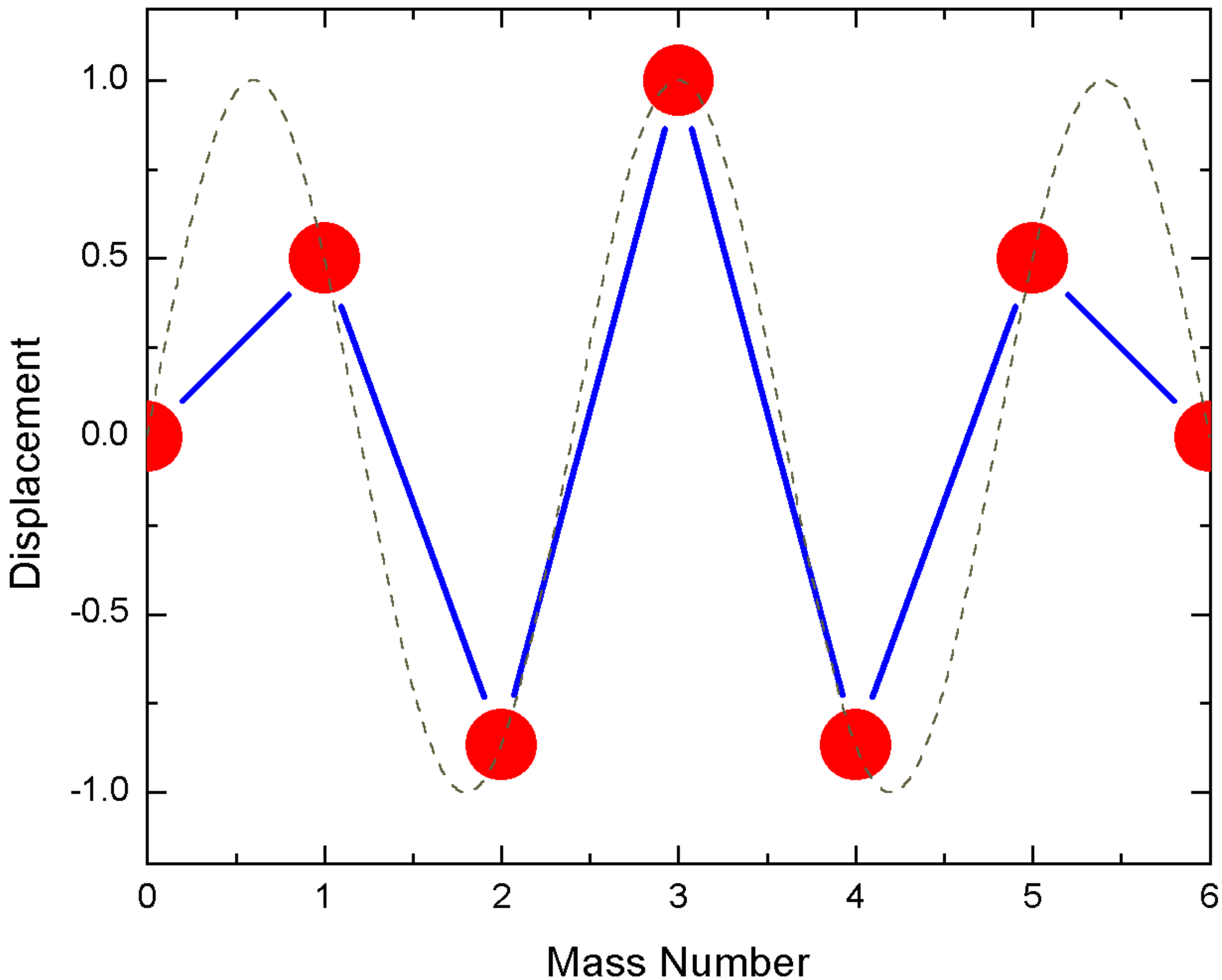
5 Mass Chain – Mode 4



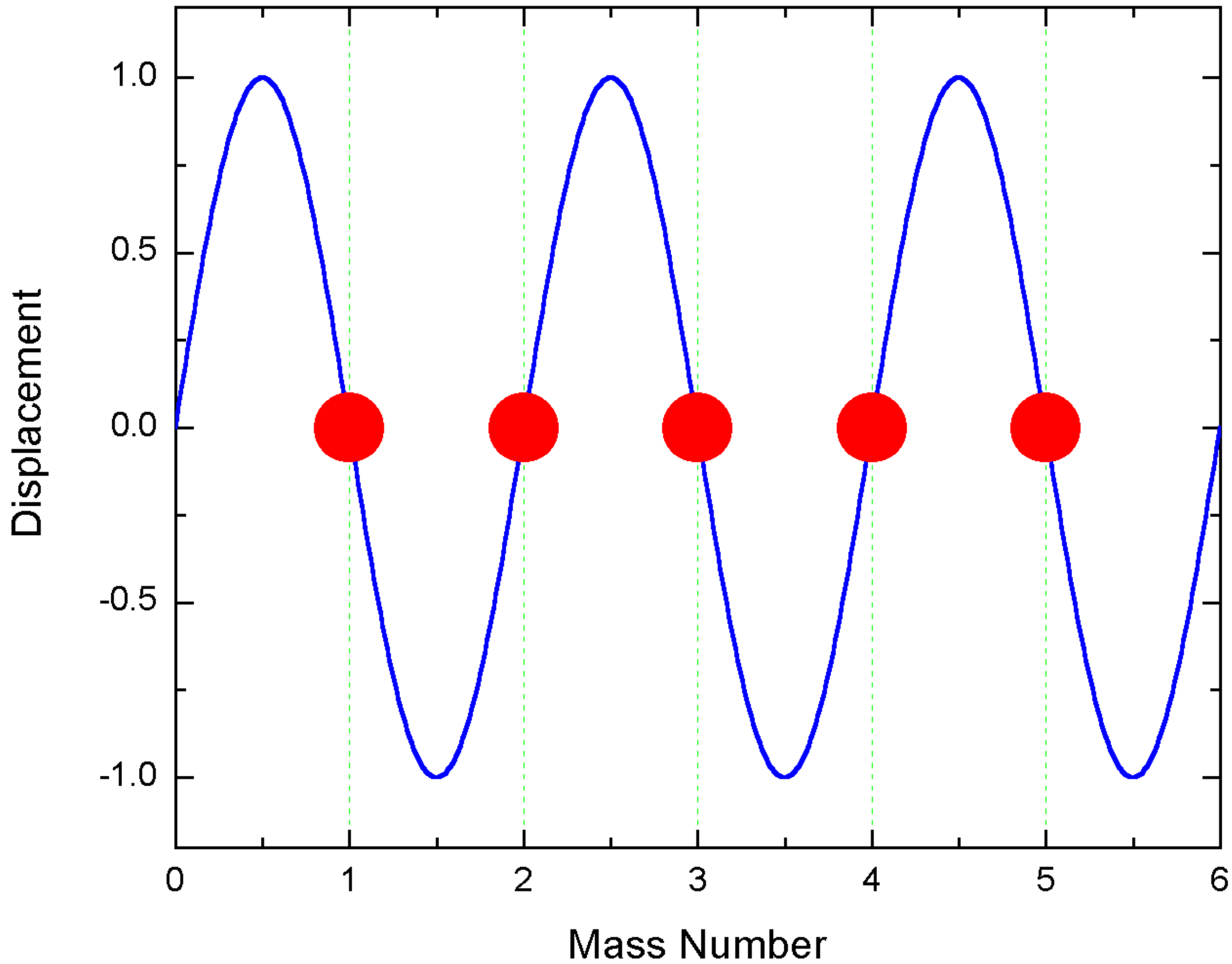
5 Mass Chain – Mode 5



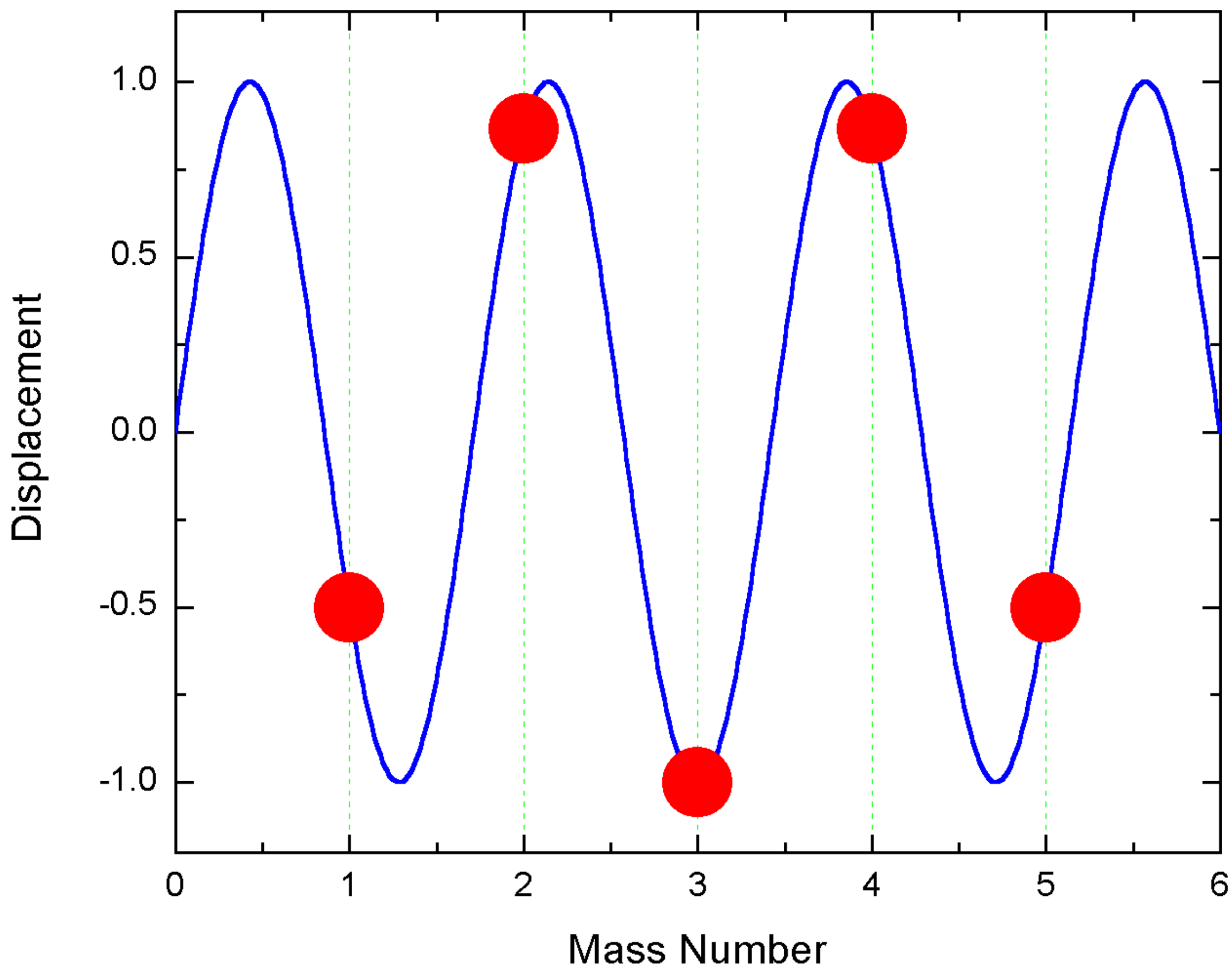
5 Mass Chain - Transverse Mode 5



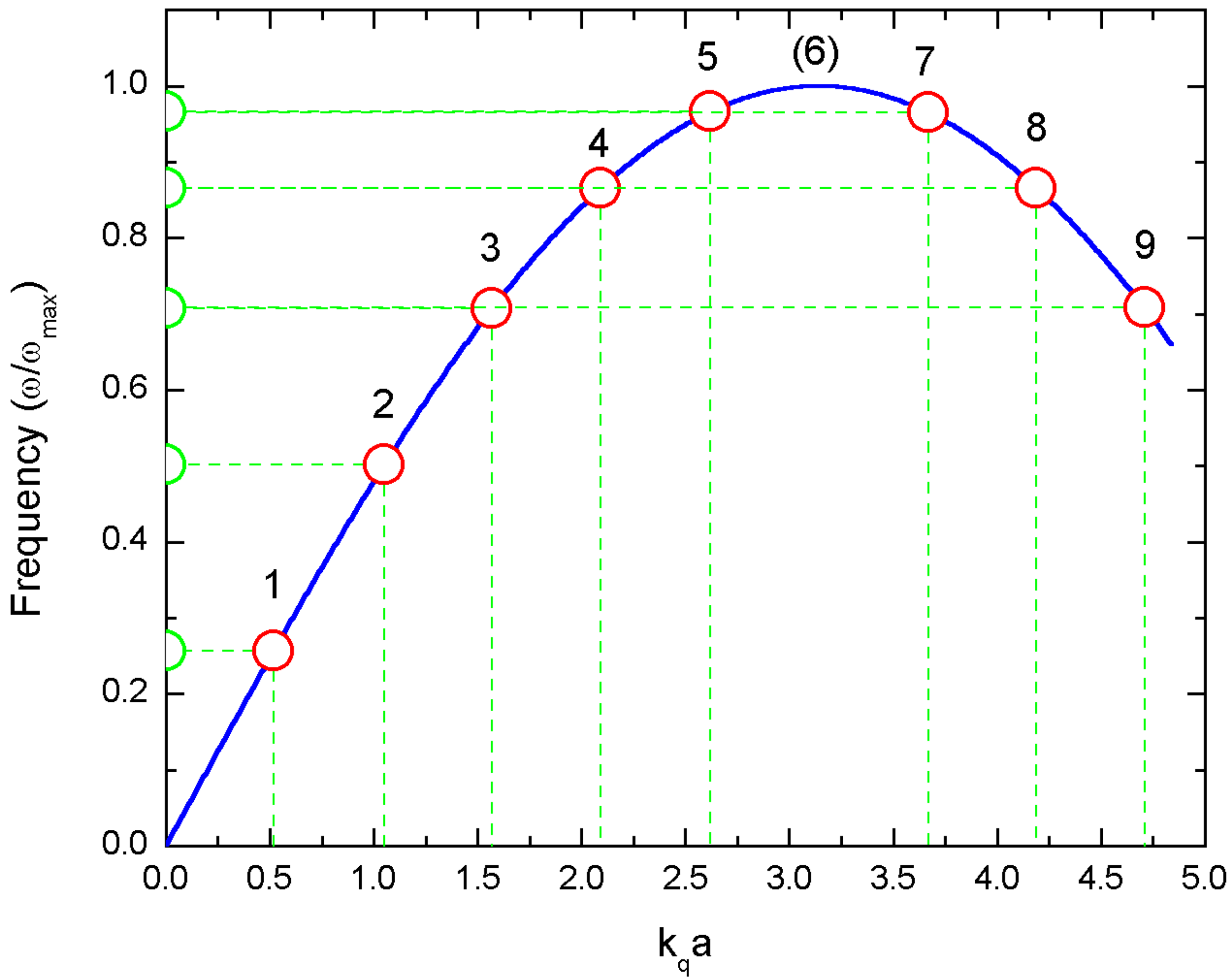
5 Mass Chain – Mode 6



5 Mass Chain – Mode 7



5 Mass Chain Dispersion Relation



5 Mass Chain Dispersion Relation
(Fixed Boundary Conditions)