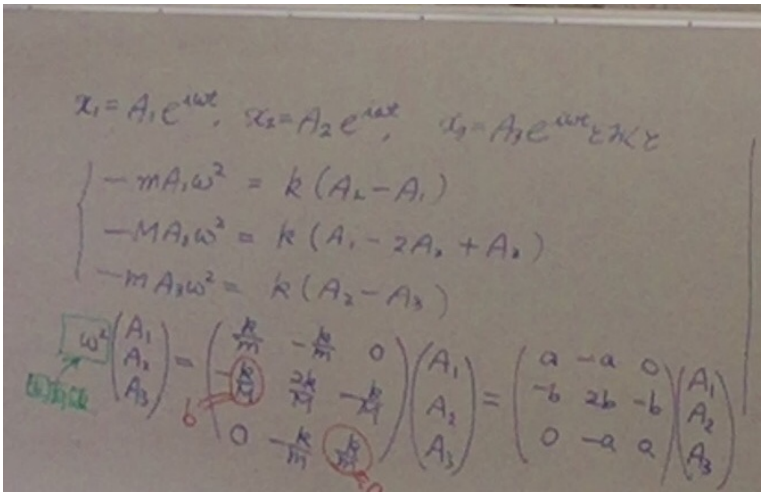
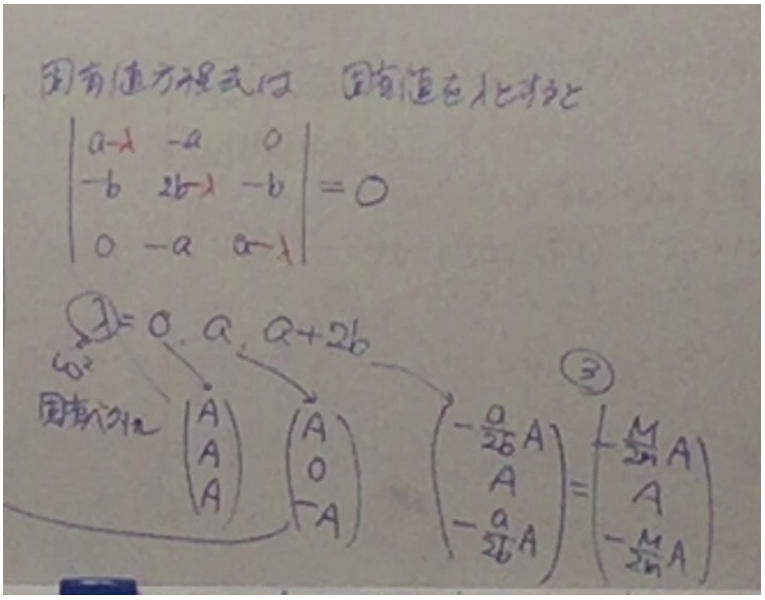
1　10

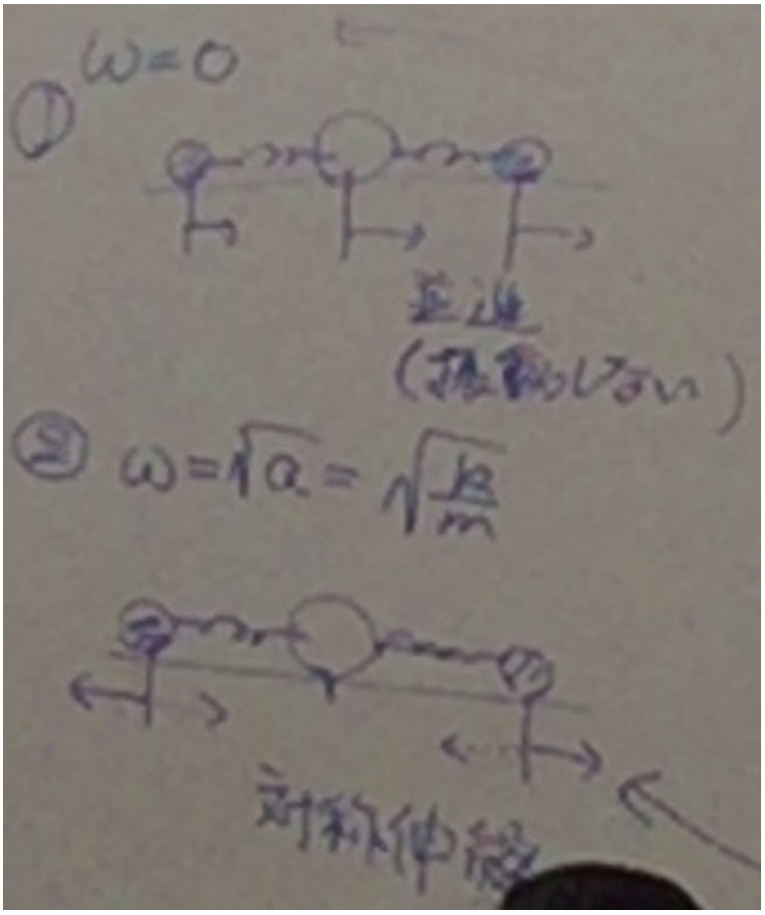
$$m\begin{cases} \dfrac{d^2x}{dt^2} = k(x_2 - x_1) & (1) \\ M\dfrac{d^2x_2}{dt^2} = -k(x_2 - x_1) + k(x_3 - x_2) & (2) \\ m\dfrac{d^2x_3}{dt^2} = -k(x_3 - x_2) & (3) \end{cases}$$

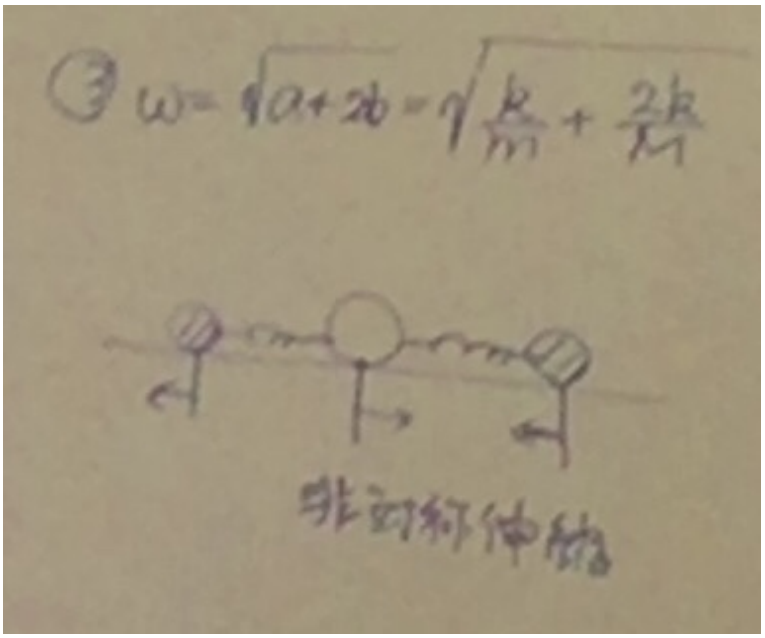
$x_1 = A_1 e^{i\,\omega\,t}, x_2 = A_2 e^{i\,\omega\,t}, x_3 = A_3 e^{i\,\omega\,t}$ とおくと

$$\begin{cases} -mA_1\,\omega^2 = k(A_2 - A_1) & (4) \\ -MA_2\,\omega^2 = k(A_1 - 2A_2 + A_2) & (5) \\ -mA_3\,\omega^2 = k(A_2 - A_3) & (6) \end{cases}$$






①
ω=0
並進
(振動しない)
②
ω=√a=√k/m
対称伸縮


③
ω=√a+2b=√k/m+2k/m
非対称伸縮