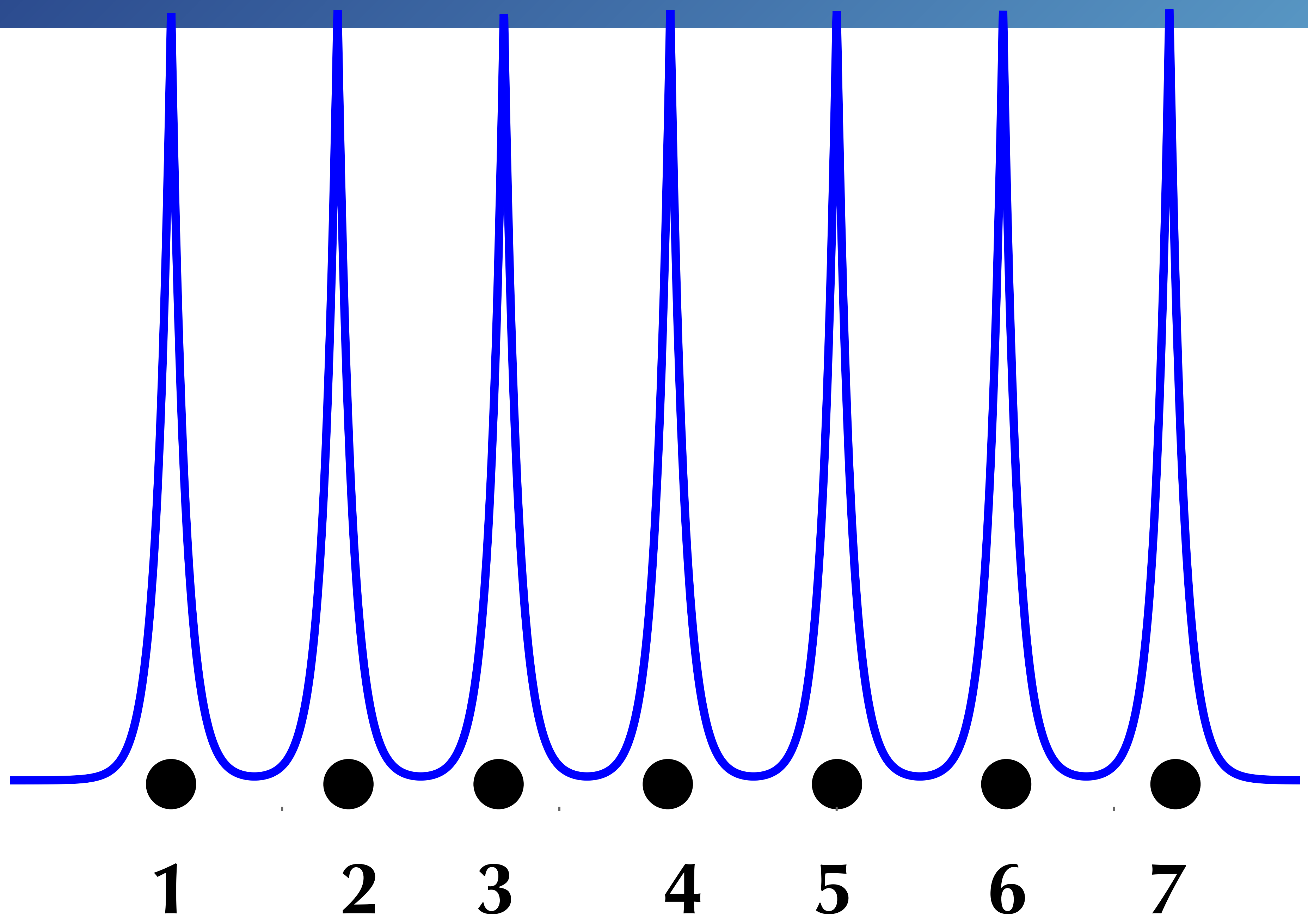

$$|\psi\rangle = \sum_{j=1}^{N} c_j |j\rangle$$

$$H|\Psi\rangle = E|\Psi\rangle \quad \boxed{1}$$

$$|\psi\rangle = \sum_{j=1}^{N} c_j |j\rangle \quad \boxed{2}$$

$$\sum_{j=1}^{N} c_j \mathbf{H}|j\rangle = E \sum_{j=1}^{N} c_j |j\rangle \quad \boxed{3}$$

$$\sum_{j=1}^{N} c_j \langle p|\mathbf{H}|j\rangle = E \sum_{j=1}^{N} c_j \langle p|j\rangle \quad \boxed{4}$$

$$\alpha c_1 + \beta c_2 = E c_1 \quad \boxed{5}$$

$$\beta c_1 + \alpha c_2 + \beta c_3 = E c_2 \quad \boxed{6}$$

$$\beta c_{j-1} + \alpha c_j + \beta c_{j+1} = E c_j \quad \boxed{7}$$

$$\beta c_{N-1} + \alpha c_N = E c_N \quad \boxed{8}$$

$$c_{j-1} - x c_j + c_{j+1} = 0 \quad \boxed{9}$$

$$x = \frac{E - \alpha}{\beta}$$

$$c_{j-1} - xc_j + c_{j+1} = 0$$

$$x = \frac{E - \alpha}{\beta}$$

$$c_j = e^{ij\theta}$$ **10**

$$e^{i(j-1)\theta} - xe^{ij\theta} + e^{i(j+1)\theta} = 0$$ **11**

$$x = e^{i\theta} + e^{-i\theta} = 2\cos\theta$$ **12**

$$c_j = Ae^{ij\theta} + Be^{-ij\theta}$$ **13**

$c_2 = xc_1$ (for p = 1) **14**

$$Ae^{2i\theta} + Be^{-2i\theta} = 2\cos\theta\left(Ae^{i\theta} + Be^{-i\theta}\right)$$

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$$A = -B$$

$$c_j = A(e^{ij\theta} - e^{-ij\theta}) = D\sin(j\theta)$$

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$$c_j = A(e^{ij\theta} - e^{-ij\theta}) = D\sin(j\theta)$$

$$(N+1)\theta = m\pi \quad \boxed{24}$$

$$c_{N-1} = xc_N \quad \boxed{17}$$

$$\boxed{\theta = \frac{m\pi}{N+1}} \quad \boxed{25}$$

$$D\sin((N-1)\theta) = xD\sin(N\theta) \quad \boxed{18}$$

$$E = \alpha + 2\beta\cos(\frac{m\pi}{N+1}) \quad \boxed{26}$$

$$D\sin((N-1)\theta) = 2D\cos(\theta)\sin(N\theta) \quad \boxed{19}$$

$$\sin((N-1)\theta) = \cos(\theta)\sin(N\theta) - \sin(\theta)\cos(N\theta) \quad \boxed{20}$$

$$2\cos(\theta)\sin(N\theta) = \cos(\theta)\sin(N\theta) - \sin(\theta)\cos(N\theta) \quad \boxed{21}$$

$$\cos(\theta)\sin(N\theta) + \sin(\theta)\cos(N\theta) = 0 \quad \boxed{22}$$

$$\sin((N+1)\theta) = 0 \quad \boxed{23}$$

$$\sin(a \pm b) = \sin(a)\cos(b) \pm \cos(a)\sin(b)$$