

$$\frac{1}{2} \times 2\pi$$

$$\sum_{j=1}^n \sin jx = \frac{\sin \frac{x}{2} \sum_{j=1}^n j}{\sin \frac{x}{2}} \quad (*)$$

$$= \frac{1}{2} \left[ (0) \frac{2n+1}{2} x - (0) \frac{x}{2} \right]$$

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$$= \frac{\sin \frac{n+1}{2} x \sin \frac{nx}{2}}{\sin \frac{x}{2}}$$

(\*)

$$\sin \frac{x}{2} \sin jx = \frac{1}{2} \left[ \cos \left( \frac{x}{2} + jx \right) - \cos \left( \frac{x}{2} - jx \right) \right]$$

$$= \frac{1}{2} \left[ \cos \left( jx + \frac{x}{2} \right) - \cos \left( -jx + \frac{x}{2} \right) \right]$$

