

$$\begin{aligned}
& \sum_{k=-\infty}^{\infty} \frac{\chi_{k-1} - \chi_k}{1/\alpha} \cdot \frac{\partial \Phi(\chi)}{\partial \chi_k} \\
&= \alpha \sum_{n=1}^{\infty} \left\{ \frac{\partial F}{\partial a_n} [a_n \cos(\pi/n) - b_n \sin(\pi/n) - a_n] \right. \\
&\quad \left. + \frac{\partial F}{\partial b_n} [b_n \cos(\pi/n) + a_n \sin(\pi/n) - b_n] \right\}
\end{aligned}$$

$$\frac{\partial}{\partial \chi_k} = \sum_{n=1}^{\infty} \left(\frac{\partial a_n}{\partial \chi_k} \cdot \frac{\partial}{\partial a_n} + \frac{\partial b_n}{\partial \chi_k} \cdot \frac{\partial}{\partial b_n} \right)$$

$$= \sum_{n=1}^{\infty} \left[\cos(k\pi/n) \frac{\partial}{\partial a_n} + \sin(k\pi/n) \frac{\partial}{\partial b_n} \right]$$

$$\begin{aligned}
\sum_{k=-\infty}^{\infty} \left(\frac{\partial}{\partial \chi_k} \right)^2 &= \sum_{n=1}^{\infty} \sum_{s=1}^{\infty} \sum_{k=-\infty}^{\infty} \left[\cos(k\pi/n) \cos(k\pi/s) \frac{\partial}{\partial a_n} \frac{\partial}{\partial a_s} \right. \\
&\quad + \sin(k\pi/n) \sin(k\pi/s) \frac{\partial}{\partial b_n} \frac{\partial}{\partial b_s} \\
&\quad + \cos(k\pi/n) \sin(k\pi/s) \frac{\partial}{\partial a_n} \frac{\partial}{\partial b_s} \\
&\quad \left. + \sin(k\pi/n) \cos(k\pi/s) \frac{\partial}{\partial b_n} \frac{\partial}{\partial a_s} \right]
\end{aligned}$$