9-6. Show, using sine and cosine modes and real variables, that this expression using complex variables is indeed correct (cf. problem 8-4).

$$\Phi_0 = \exp\left(-\sum_{\mathbf{k}} \frac{kc}{2\hbar}\left(\bar{a}_{1,\mathbf{k}}^* \bar{a}_{1,\mathbf{k}} + \bar{a}_{2,\mathbf{k}}^* \bar{a}_{2,\mathbf{k}}\right)\right)$$