1. Come up with an example to illustrate each of the following terms:

   (a) equivalent lines
   (b) closed graph
   (c) open graph
   (d) interchangeable operators
   (e) equivalent operators
   (f) interchangeable subgraphs
   (g) equivalent subgraphs
   (h) Goldstone path
   (i) Hugenholtz path
   (j) open cycle
   (k) loop
   (l) connected graph
   (m) disconnected graph
   (n) unlinked graph
   (o) equivalent contractions
   (p) energy graph
   (q) coefficient graph
   (r) wavefunction graph

2. Prove the following identity.

$$\tilde{a}^{p_1\cdots p_m}_{q_1\cdots q_m} = (\tfrac{1}{m!})^2\, \overline{\delta}^{q'_1\cdots q'_m}_{p'_1\cdots p'_m}\, \tilde{a}^{p'_1\cdots p'_m}_{q'_1\cdots q'_m} \qquad\qquad \overline{\delta}^{q'_1\cdots q'_m}_{p'_1\cdots p'_m} \equiv \hat{P}^{(p_1/\cdots/p_m)}_{(q_1/\cdots/q_m)}\, \delta^{p_1}_{p'_1}\cdots\delta^{p_m}_{p'_m}\delta^{q'_1}_{q_1}\cdots\delta^{q'_m}_{q_m}$$