You did this denervation previously, so I'm just doing it again to try things out.

one e- int for no differences be twin determinants

$$< \Psi|H_0|\Psi >= \mathrm{h}^{\alpha\beta} < vac|(\prod_\kappa a_\kappa) a^\dagger_\alpha a_\beta \prod_{\kappa'} a^\dagger_{\kappa'}|vac >$$

$$= h^{\alpha\beta} < vac|(\prod_\kappa a_\kappa) a^\dagger_\alpha \delta_{\beta\kappa_1} \prod_{\kappa'=\{\kappa_2\ldots\kappa_n\}} a^\dagger_{\kappa'}|vac >$$

$$-h^{\alpha\beta} < vac| \prod_\kappa a_\kappa) a^\dagger_\alpha a^\dagger_{\kappa_1} a_\beta \prod_{\kappa'=\{\kappa_2\ldots\kappa_n\}} a^\dagger_{\kappa'}|vac >$$

$$= h^{\alpha\beta} < vac|(\prod_\kappa a_\kappa) a^\dagger_\alpha \delta_{\beta\kappa_1} \prod_{\kappa'=\{\kappa_2\ldots\kappa_n\}} a^\dagger_{\kappa'}|vac >$$

$$+h^{\alpha\beta} < vac| \prod_{\kappa=\{\kappa_n\ldots\kappa_1\}} a_\kappa) a^\dagger_{\kappa_1} a^\dagger_\alpha a_\beta \prod_{\kappa'=\{\kappa_2\ldots\kappa_n\}} a^\dagger_{\kappa'}|vac >$$

$$= h^{\alpha\beta} < vac|(\prod_\kappa a_\kappa) a^\dagger_\alpha \delta_{\beta\kappa_1} \prod_{\kappa'=\{\kappa_2\ldots\kappa_n\}} a^\dagger_{\kappa'}|vac >$$

$$+h^{\alpha\beta} < vac| \prod_{\kappa=\{\kappa_n\ldots\kappa_2\}} a_\kappa) a^\dagger_\alpha a_\beta \prod_{\kappa'=\{\kappa_2\ldots\kappa_n\}} a^\dagger_{\kappa'}|vac >$$

$$= h^{\alpha\beta}\delta_{\alpha\kappa_1}\delta_{\beta\kappa_1} + h^{\alpha\beta} < vac|(\prod_{\kappa=\{\kappa_n\ldots\kappa_2\}} a_\kappa) a^\dagger_\alpha a_\beta \prod_{\kappa'=\{\kappa_2\ldots\kappa_n\}} a^\dagger_{\kappa'}|vac >$$

$$= \ldots$$

$$= \sum_\kappa h^{\alpha\beta}\delta_{\alpha\kappa}\delta_{\beta\kappa}$$

$$= \sum_\kappa h^{\kappa\kappa}$$

$$= \sum_\kappa h^{(\kappa)(\kappa)}\delta_{[\kappa],[\kappa]}$$

$$= \sum_\kappa h^{(\kappa)(\kappa)}$$

Mainly I'm worried that I'm getting so many terms in my derivation, but maybe this aspect is normal?

to e- int for no defences between two determinants

In general I want to know if I'm making things too hard for myself or if I'm full doing the right process that could you comment on this?

$$< \Psi|V|\Psi >= v^{\alpha\beta\gamma\delta} < vac|(\prod_\kappa a_\kappa) a^\dagger_\alpha a^\dagger_\beta a_\gamma a_\delta \prod_{\kappa'} a^\dagger_{\kappa'}|vac >$$

$$= v^{\alpha\beta\gamma\delta} < vac|(\prod_\kappa a_\kappa) a^\dagger_\alpha a^\dagger_\beta a_\gamma \delta_{\delta\kappa_1} \prod_{\kappa'=\{\kappa_2\ldots\kappa_n\}} a^\dagger_{\kappa'}|vac >$$

$$-v^{\alpha\beta\gamma\delta} < vac|(\prod_\kappa a_\kappa) a^\dagger_\alpha a^\dagger_\beta a_\gamma a^\dagger_{\kappa_1} a_\delta \prod_{\kappa'=\{\kappa_2\ldots\kappa_n\}} a^\dagger_{\kappa'}|vac >$$

$$= v^{\alpha\beta\gamma\delta}\delta_{\delta\kappa_1} < vac|(\prod_\kappa a_\kappa) a^\dagger_\alpha a^\dagger_\beta a_\gamma \prod_{\kappa'=\{\kappa_2\ldots\kappa_n\}} a^\dagger_{\kappa'}|vac >$$

$$-(1)$$

$$= v^{\alpha\beta\gamma\delta}\delta_{\delta\kappa_1}\delta_{\gamma\kappa_2} < vac|(\prod_\kappa a_\kappa) a^\dagger_\alpha a^\dagger_\beta \prod_{\kappa'=\{\kappa_3\ldots\kappa_n\}} a^\dagger_{\kappa'}|vac >$$

$$-v^{\alpha\beta\gamma\delta}\delta_{\delta\kappa_1} < vac|(\prod_\kappa a_\kappa) a^\dagger_\alpha a^\dagger_\beta a^\dagger_{\kappa_2} a_\gamma \prod_{\kappa'=\{\kappa_3\ldots\kappa_n\}} a^\dagger_{\kappa'}|vac > - (1)$$

$$= \sum_{\kappa_1\kappa_2} v^{\alpha\beta\gamma\delta}\delta_{\delta\kappa_1}\delta_{\gamma\kappa_2}\delta_{\beta\kappa_2}\delta_{\alpha\kappa_1} - v^{\alpha\beta\gamma\delta}\delta_{\delta\kappa_1} < vac|(\prod_{\kappa=\{\kappa_n\ldots\kappa_2\}} a_\kappa) a_{\kappa_1} a^\dagger_{\kappa_2} a^\dagger_\alpha a^\dagger_\beta a_\gamma \prod_{\kappa'=\{\kappa_3\ldots\kappa_n\}} a^\dagger_{\kappa'}|vac >$$

I'm having trouble getting the 2 e- int to a form that I can access. Am I doing this correctly on the right here?

$$= \sum_{\kappa_1\kappa_2} v^{\kappa_1\kappa_2\kappa_2\kappa_1} - v^{\alpha\beta\gamma\delta}\delta_{\delta\kappa_1}\delta_{\kappa_1\kappa_2} < vac|(\prod_{\kappa=\{\kappa_n\ldots\kappa_2\}} a_\kappa) a^\dagger_\alpha a^\dagger_\beta a_\gamma \prod_{\kappa'=\{\kappa_3\ldots\kappa_n\}}$$

$$a^\dagger_{\kappa'}|vac > +v^{\alpha\beta\gamma\delta}\delta_{\delta\kappa_1} < vac|(\prod_{\kappa=\{\kappa_n\ldots\kappa_3\}} a_\kappa) a^\dagger_\alpha a^\dagger_\beta a_\gamma \prod_{\kappa'=\{\kappa_3\ldots\kappa_n\}} a^\dagger_{\kappa'}|vac >$$

$$= \sum_{\kappa_1\kappa_2} v^{(\kappa_1)(\kappa_2)(\kappa_2)(\kappa_1)}\delta_{[\kappa_1],[\kappa_2]} + \ldots$$