Diagrammi di Goldstone-Feynman

Il numeratore di eq. GF23 sviluppato al 1° ordine è dato da:

$$i\tilde{G}(x,y) = iG^0(x,y) + \left(\frac{-i}{\hbar}\right)\frac{1}{2}\int d^4x_1 \int d^4x_1'\, \mathcal{U}(x_1,x_1')$$
$$\langle \Phi_0 | T[\psi^\dagger(x_1)\psi^\dagger(x_1')\psi(x_1')\psi(x_1)\psi(x)\psi^\dagger(y)] | \Phi_0\rangle$$

Usiamo il teorema di Wick:

$$\langle \Phi_0 | T[\psi^\dagger(x_1)\psi^\dagger(x_1')\psi(x_1')\psi(x_1)\psi(x)\psi^\dagger(y)] | \Phi_0\rangle$$
$$+\langle \Phi_0 | T[\psi^\dagger(x_1)\psi^\dagger(x_1')\psi(x_1')\psi(x_1)\psi(x)\psi^\dagger(y)] | \Phi_0\rangle$$
$$+\langle \Phi_0 | T[\psi^\dagger(x_1)\psi^\dagger(x_1')\psi(x_1')\psi(x_1)\psi(x)\psi^\dagger(y)] | \Phi_0\rangle$$
$$+\langle \Phi_0 | T[\psi^\dagger(x_1)\psi^\dagger(x_1')\psi(x_1')\psi(x_1)\psi(x)\psi^\dagger(y)] | \Phi_0\rangle$$
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$$+\langle \Phi_0 | T[\psi^\dagger(x_1)\psi^\dagger(x_1')\psi(x_1')\psi(x_1)\psi(x)\psi^\dagger(y)] | \Phi_0\rangle$$

$$= iG^0(x,y)\left[-iG^0(x_1,x_1)\right]\left[-iG^0(x_1',x_1')\right]$$
$$+ iG^0(x,y)\left[-iG^0(x_1,x_1')\right]\left[+iG^0(x_1',x_1)\right]$$
$$+ iG^0(x,x_1)\left[iG^0(x_1,x_1')\right]\left[iG^0(x_1',y)\right]$$
$$+ iG^0(x,x_1)\left[-iG_0(x_1',x_1')\right]\left[iG^0(x_1,y)\right]$$
$$\left[-iG^0(x,x_1')\right]\left[-iG^0(x_1',x_1)\right]\left[iG^0(x_1,y)\right]$$
$$\left[-iG^0(x,x_1')\right]\left[iG^0(x_1,x_1)\right]\left[iG^0(x_1',y)\right]$$