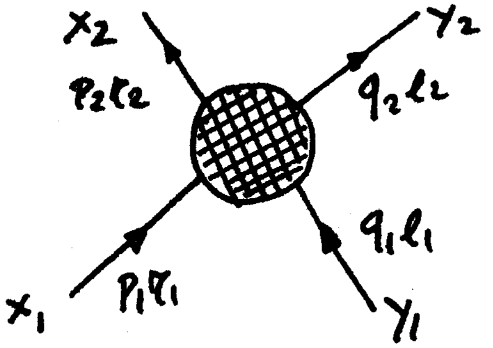
(2) (6) If $$S_{F\alpha\beta}(x-y) = (i\not\partial + m) D_F(x-y)$$

Show that: $$S_{F\alpha\beta}(x-y) = \frac{1}{(2\pi)^4}\int d^4p\, e^{-ip(x-y)} \left(\frac{i}{\not p - m}\right)_{\alpha\beta}$$

(5) (7) Show that: $$b_{IN}(\vec p) = \frac{1}{(2\pi)^{3/2}}\sqrt{\frac{M}{E}}\int d^3x\, \tilde u_r(\vec p)\gamma^0 \psi_{IN}(x)\, e^{ipx}$$

(10) (8) Consider the 4 fermion process where $p_1+q_1 \to p_2+q_2$




4 fermions of 4-momenta $p_1 p_2 q_1 q_2$ and spin $r_1 r_2 l_1 l_2$

Show that the amplitude for this process is: $${}_{out}\langle p_2 r_2 q_2 l_2 | p_1 r_1 q_1 l_1\rangle_{IN} =$$

$$= \frac{-i}{(2\pi)^{3/2}}\sqrt{\frac{M}{E_{p_1}}}\int d^4x\, e^{-ip_1x}\langle p_2 r_2 q_2 l_2|\tilde\psi(x)|q_1 l_1\rangle(-i\overleftarrow{\not\partial} - m)U_r(\vec p_1)$$

$$= \frac{(+i)}{\sqrt{(2\pi)^3}}\frac{(-i)}{\sqrt{(2\pi)^3}}\frac{(+i)}{\sqrt{(2\pi)^3}}\frac{(-i)}{\sqrt{(2\pi)^3}}\sqrt{\frac{M}{E_{p_1}}}\sqrt{\frac{M}{E_{p_2}}}\sqrt{\frac{M}{E_{q_1}}}\sqrt{\frac{M}{E_{q_2}}}\times$$

$$\int d^4x_1\int d^4x_2\int d^4y_1\int d^4y_2\; e^{-i(p_1x_1+q_1y_1-p_2x_2-q_2y_2)}\times$$

$$[\bar u(r_2p_2)(\gamma\cdot p_2 - M)]_\alpha[\bar u(q_2l_2)(\gamma\cdot q_2 - M)]_\beta$$
$$\langle 0|T\{\psi_\alpha(x_2)\psi_\beta(y_2)\tilde\psi_\gamma(x_1)\tilde\psi_\delta(y_1)\, e^{-i\int H_I d^4u}\}|0\rangle\times$$
$$[(\gamma\cdot p_1 - M)u(r_1p_1)]_\gamma[(\gamma\cdot q_1 - M)u(l_1q_1)]_\delta$$

What process do you get from the $e^2$ contribution ?