1 (canonical approach still): Given eq. 130.1 (in the notes), and the properties of *a*, *b*, *u* and *v*, obtain the Feynman propagator for fermions:

$$S_F(x-y) \equiv \langle 0 | T\{\psi(x)\bar{\psi}(y)\} | 0 \rangle = \int \frac{d^4p}{(2\pi)^4} \frac{i(\not{p}+m)}{p^2-m^2+i\epsilon} e^{-ip(x-y)}$$

(attention to the time ordering for fermions:)

$$T\{\psi(x)\bar{\psi}(y)\} = \begin{cases} \psi(x)\bar{\psi}(y) & x^0 > y^0 \\ -\bar{\psi}(y)\psi(x) & y^0 > x^0 \end{cases}$$

2 (In the context of pg 133 of the lecture notes) show that:

$$\frac{\partial}{\partial \theta_k} e^{\sum \theta_i \eta_i} = \eta_k \, e^{\sum \theta_i \eta_i} \qquad\qquad \frac{\partial}{\partial \eta_k} e^{\sum \theta_i \eta_i} = -\theta_k \, e^{\sum \theta_i \eta_i}$$

3 In analogy to what we did for the bosonic harmonic oscillator, obtain eq 138.3 of the lecture notes