4/10/15

QUANTUM MECHANICS II (524)
PROBLEM SET 9 (hand in April 17 and the numerical work within the next two weeks)

22) (10 points) Derive **all** the anticommutation relations for fermion addition and removal operators except the one done in class.

23) (10 points) In the case of spin-1/2 charged fermions work out the second-quantized form of

a) the charge density operator

b) the spin density operator (z-component only)

by choosing an appropriate (simplest) single-particle basis in which to evaluate the single-particle matrix elements.

24) (10 points) Demonstrate that

$$\langle \mu\alpha_2...\alpha_N | \hat{V} | \nu\alpha_2...\alpha_N \rangle = \sum_{\alpha \in \{\alpha_i\}} [(\mu\alpha|V|\nu\alpha) - (\mu\alpha|V|\alpha\nu)] + \delta_{\mu\nu} \langle \alpha_2...\alpha_N | \hat{V} | \alpha_2...\alpha_N \rangle .$$