Physics 5455 – Problem set 2

1. Schwabl 2.2(a,c). Note that $\Theta(x)$ is the Heaviside step function:

$$\Theta(x) = \begin{cases} 
0 & x < 0 \\
1 & x > 0 
\end{cases}$$

2. Schwabl 2.5(a,b,c).

3. (a) Show that


(You proved an analogous result for Poisson brackets recently.)

(b) Show that

$$e^A e^B = e^B e^A e^{[A,B]}$$

when $[[A, B], A] = 0 = [[A, B], B]$. Hint: consider the $\lambda$ derivative of $e^{\lambda A} e^{\lambda B}$, $e^{\lambda B} e^{\lambda A} e^{\lambda [A,B]}$. 