215a Homework exercises 1, due Oct. 19

Homework exercise key: "Luke problem $n.m$" refers to exercise set n, problem m, which can be found at

http://www2.physics.utoronto.ca/∼luke/PHY2403/Assignments.html

Likewise, "Tong problem $n.m$" refers to homework that can be found at

http://www.damtp.cam.ac.uk/user/tong/qft.html

1. Luke 1.5 (the problem about mass dimensions).
2. Luke 2.5 (the problem about $T^{\mu\nu}$ and $\Theta^{\mu\nu}$ for Maxwell theory).
3. Tong 1.3 (problem about the complex field, that we also discussed in class).
4. Tong 1.4 (problem about $SO(3)$ rotation symmetry).
5. Tong 2.3 (problem about P^μ operator).
6. Tong 2.5 (show $\langle 0|\phi(x)|p\rangle = e^{-ip\cdot x}$). Note that Tong's normalization of the creation and annihilation operators differ by $a(k)_{here} = \sqrt{2\omega_k}a(k)_{Tong}$, but that change drops out in the end, since $\phi_{here} = \phi_{Tong}$ and $|p\rangle_{here} = |p\rangle_{Tong}$. Both normalizations are common, so it's good for you to get used to seeing either one.
7. Tong 2.9
8. Tong 2.10
9. Luke 3.1a and 3.1b (Klein-Gordon theory with source).