**Phys 522**

**Fall 2015-16**

**Homework 1**

**Due on October 2**

1. Text 8.1
2. An electromagnetic field produced by a laser is represented approximately by



where  is eigenstate of the number operator with the property

, such that

1. Calculate ensemble averages of <a> and <a+a>.
2. Calculate the variance  in the number of photons and hence calculate the relative fluctuation .
3. Consider an electron of intrinsic spin  and magnetic moment B placed in a magnetic field in the B in the z direction.
4. Calculate the density matrix of this system in the representation where z is diagonal.
5. Calculate the average value of z in this representation.