

Chem1410 HW #3. Assigned 9/10; due 9/18.

1. Is  $\sin(\pi x/a)$  an eigenfunction of  $p_x$  on the interval  $[0,a]$ ? What values of the momentum can you get from individual measurements? What is the average momentum? What is the average position? Write  $\sin(\pi x/a)$  as a linear combination of eigenfunctions of the momentum operator.
2. Consider a particle confined between  $[0,a]$ . Is  $\psi = x$ ,  $0 \leq x \leq a/2$  and  $\psi = a-x$ ,  $a/2 \leq x \leq a$  ( note that this was incorrect in the original posting), a proper wave function? Why or why not? Now consider  $\psi = x(a-x)$ ? Is this a proper wave function on  $[0,a]$ ? Normalize the latter function, and compute the average of  $x$ ,  $p_x$ , and  $(p_x)^2$ .