1. Two level square well.
Sketch the n=3 stationary state for the well shown.
Hints: first, consider how many wiggles the n=3 state has. Then, find the ratio of wavelelngths in the right and left sides.

"3 wiggles" $K_r = K_L/4$ $p_r = p_L/2$ $\lambda_r = 2\lambda_L$

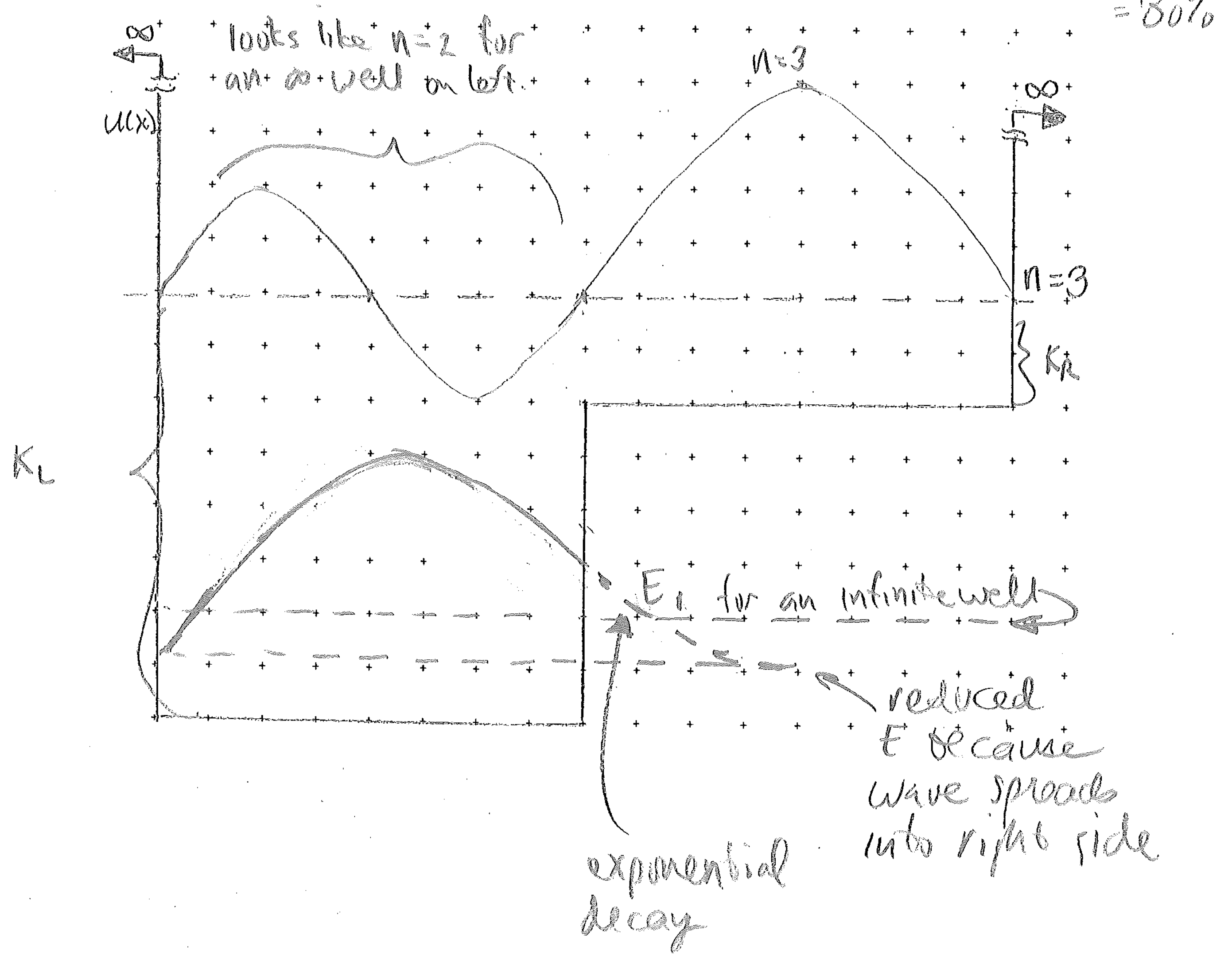
Next, draw the n=1 stationary state, showing its approximate energy. Something to consider: for n=1, is the wave *entirely* in the left side of the well? No!

If the particle is in the n=3 state, what is the probability of finding it in the right half of the well? Hint: what is the amplitude of your sine wave in each half? How does probability depend on amplitude?

$A_R = 2A_L$ because $\lambda_R = 2\lambda_L$ & wave is smooth. so $P_R = 4P_L$, $P_R + P_L = 1$

$P_R = 0.8$
$= 80\%$

For a classical particle with this same energy, where is the particle most likely to be found? On the right side, where it moves slower.



2. Shallow, finite square well. As a finite well gets shallower, the bound state kinetic energy must get lower. (Otherwise, K would become larger than U_0.) That means the momentum, and the momentum uncertainty, gets smaller. But the well <u>width</u> remains constant. What's going on here? Doesn't this violate Heisenberg's rule?

Explain, by drawing graphs of the lowest energy stationary state for increasingly shallow wells. (Assume the deepest well is "almost infinitely deep." Draw a dashed line to show the energy of the lowest state… in the deepest well, put the energy level ¼ of the way up from the bottom. Draw the lowest energy levels for the other wells in a qualitatively correct manner.)