A ball of mass $m$ rolls back and forth without any loss of energy between two very high walls (at $x=0$ & $x=2L$). There is a ramp centered at $x=L$ that extends upward to a height $s$ less than $h$. The ball has total energy $E_{TOTAL} = mgh$ (kinetic plus potential).

1) Is the total energy of the ball as it rolls from $x=2L$ to $x=0$ increasing, decreasing or staying the same? (Explain your answer)

2) Sketch below (all on one graph) the kinetic energy, gravitational potential energy, and total energy of the ball between $x=0$ and $x=2L$. 

For these problems, you may find it helpful to play with the Quantum Tunneling Sim: [http://phet.colorado.edu/en/simulation/quantum-tunneling](http://phet.colorado.edu/en/simulation/quantum-tunneling)

This following YouTube video is also very helpful. In the beginning of the video (for 1 min and 4 seconds) the general mathematical structure of Schrödinger equation is explained. You can choose to fast forward this part. After this the video goes to great length in explaining the basic theory and applications of quantum tunneling.

https://www.youtube.com/watch?v=EuU9Yin_2mM&ebc=ANyPxKoCb8Alp9pgViXXODRQWyHCkwqmkYHr6B6L4bvhT2ZdlUfemdvx8xM1ZfQlTYGqYpxfCvY5-_lKI7YSLr7Z__siPdEAvg&nohtml5=False
3) Is the amount of time the ball spends between x=0 and x=L greater than, less than or equal to the amount of time it spends between x=L and x=2L? (Ignore any time the ball spends on the ramp.)

4) If someone were to take a photograph of the ball at some random time, would the probability of finding the ball in the first half (between x=0 & x=L) be greater than, less than, or equal to the probability of finding it in the second half (between x=L & x=2L)? Why?