Solve the problem below on this paper in the spaces provided. In your solution you need to show not only the answers but the steps or rationale you used to arrive at the answer. Your answers need to be complete enough to make your work checkable. If you need more space, you may attach a paper with the continued part of the problem clearly designated as the continued part.

Points: 1) 66%, 2) 34%
1.

For this problem, you may need the relations:

\[ v = \dot{\theta} \rho, \quad a_n = \frac{v^2}{\rho}, \quad a_t = \ddot{\theta} \rho. \]

The pendulum at right is given an initial velocity \( v_1 \) when it is in its vertical position. At position 2, there is no tension in the string attaching the pendulum bob (mass) to the pivot point.

a. Draw FBD = MAD for the pendulum bob (mass) in position 2.

\[ \text{FBD} = \text{MAD} \]

b. Find a relationship involving just \( g, \ell, \theta \) and its derivatives that defines the no-tension situation at point 2.
c. Write an energy relationship, and then solve it for $\theta$ in terms of just $v_1, v_2, g$, and $L$. 
2.

In the system shown at right, block A is sliding on a surface with an initial velocity $v_1$ and a dynamic friction coefficient $\mu$, while block B is travelling downward without contacting the adjacent walls. The friction at A is however great enough that $m_A$ slides to a halt before it reaches the pulley.

How far will the blocks move ($d$) before the system comes to a halt? Find your answer in terms of the variables shown in the figure.