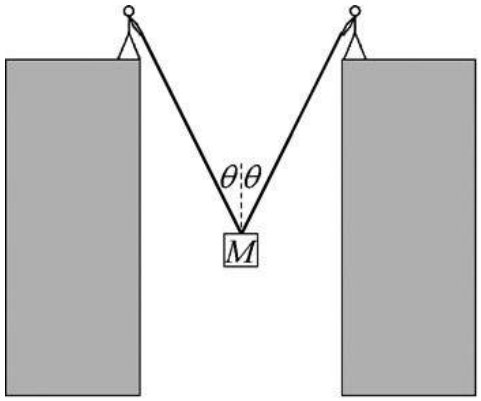
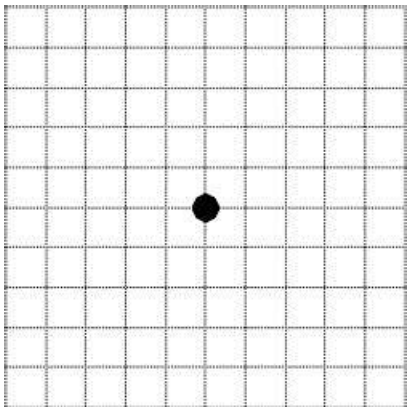
NAME _____ DATE _____

Scenario

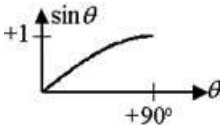
Two people standing on equal-height buildings are lifting a box of mass M between the buildings using two ropes. The people keep the two ropes the same length between their hands and the box so that both ropes make an angle θ with the vertical.

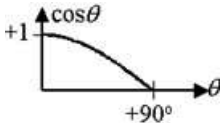


PART A: On the dot below that represents the box, draw and label the forces exerted on the box at one moment in time when the box is at rest.



PART B: Derive an expression for the magnitude of the tension F_T in the two ropes in terms of M, θ, and fundamental constants.





PART C: The graphs above show the values of $\sin\theta$ and $\cos\theta$ for angles between $0°$ and $+90°$. The two people notice that as the box rises at constant velocity, the force they must exert on the ropes becomes greater and greater, and they cannot make the ropes horizontal no matter how much force they exert. Use your equation from Part B and one or both of the graphs above to explain why the people have these experiences.