

Worksheet Now is the Winter of our Discontent

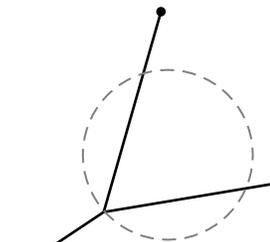
1. SHORTEST NETWORK. Last time we showed that a Λ -shaped network can be improved if and only if the vertex angle is less than 120° .

(b) Prove that the network to the right is NOT minimizing.

You don't need to find the optimal network, just prove that this one can be improved. Hint: consider the portion of the network that is inside the circle.

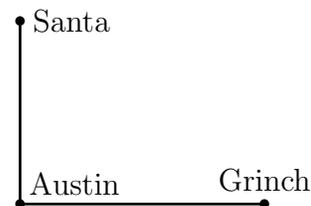
(c) What allowed that trick to work? Phrase your answer like this: "Any network which contains _____ can be improved."

(d) Put it all together, and explain where the soap puts the roundabout.



2. (Adapted from a Fall, 2005 Math 115 Final Exam) This holiday season Austin is expecting a large bounty of new Star Wars action figures to be under the tree at his house, given that a new movie is coming out. The action figures need to be delivered by Santa, but the Grinch is attempting to arrive first and steal the presents before Austin wakes up.

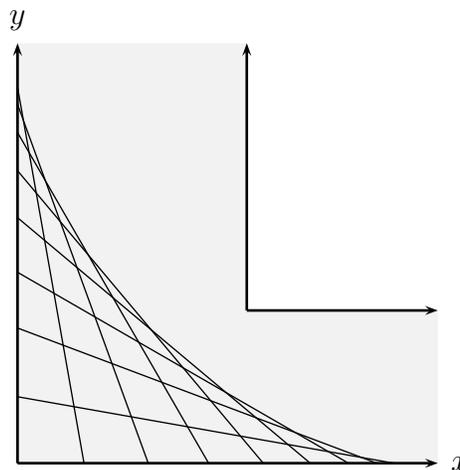
Assume that Santa is directly North of the house (therefore traveling due South) while The Grinch is directly East of the house (traveling due West). Assume that both Santa and the Grinch are flying at the same altitude. Santa is moving at 30 miles per hour, and the Grinch is going 28 miles per hour. How fast is the distance between them changing when Santa is 120 miles from Austin's house and the Grinch is 160 miles from the house?



3. Suppose we are carrying a ladder down a hallway, and then turning it to get around a corner, always keeping the ends of the ladder against the walls. The question is: **Which points on the floor does the ladder pass over?** Let's assume the ladder has length 1. In the picture, the gray area is the hallway and the fine lines are the ladder in different positions.

(a) Suppose the base of the ladder is at the point $(u, 0)$. Where on the y -axis is the top of the ladder? Draw a picture!

(b) Suppose you are standing at $(x, 0)$ and looking north (up the page). If $x < u$, how far away do you see the ladder?



To be continued...

