**BLC 190**                                    **Name:** _____
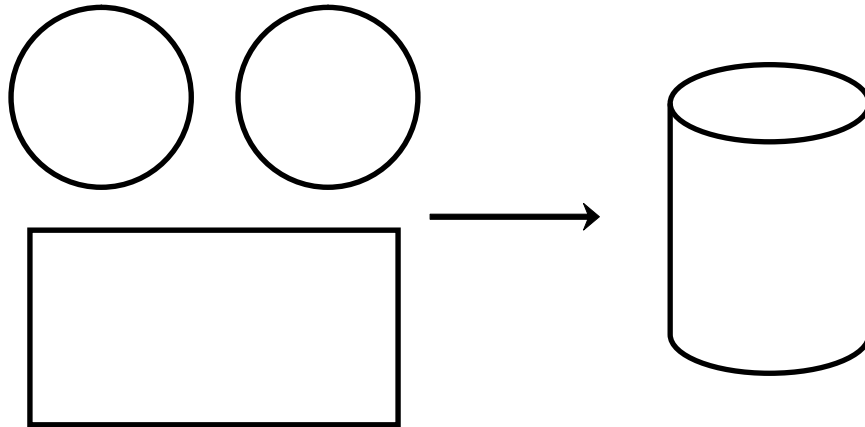
# Homework 6

1. A beverage company is making a large cylindrical juice can using two circles and a rectangle:



(a) The bottom circle and top circle for the juice can both cost \$3.00 per square foot. If the circle has radius $r$, what is the total cost of the top and bottom circles?

(b) The beverage company uses the rectangle to make the side of the juice can. If the height of the juice can is $h$, what is the area of the rectangle in terms of $h$ and $r$?

(c) If it costs \$4.00 per square foot to make the rectangle, how much does it cost in terms of $r$ and $h$?

(d) What is the volume of the can in terms of $r$ and $h$?

(e) Suppose that the total cost of the cylindrical can is $40.00. Express the volume of the cylindrical can as a function of $r$.

(f) Sketch the graph of the function from part (d).
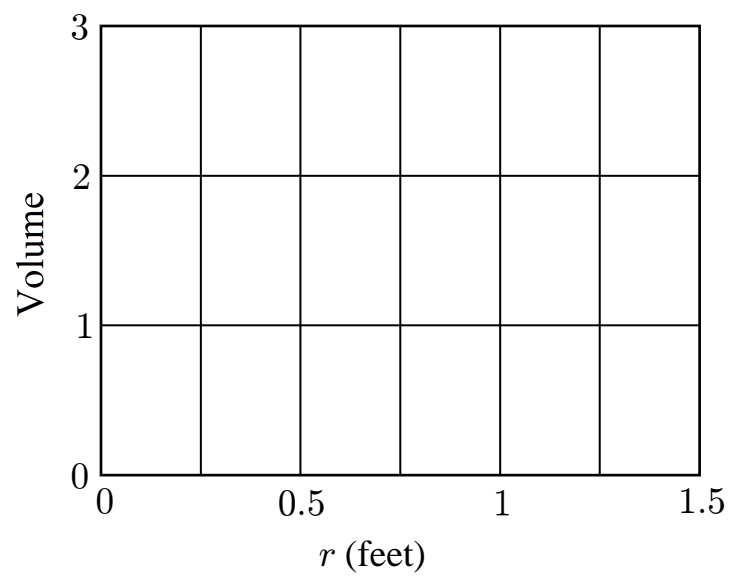
2. In Mario Kart (and other racing games) it is usually faster to drive on the road than off the road. Suppose that Mario can travel 2 units/second off the road, and 5 units/second on the road. When he is 10 units away from the finish line, he gets knocked 5 units away from the road:
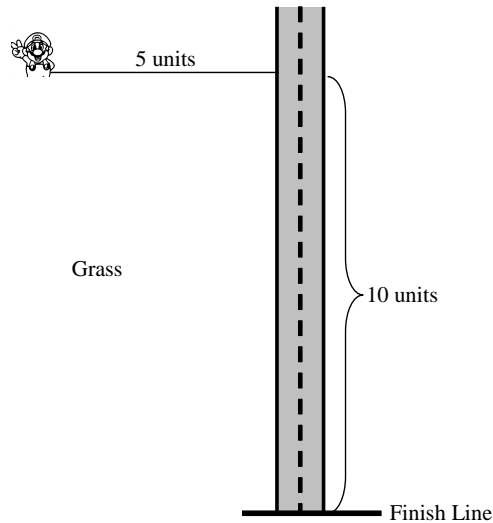


(a) How far is Mario from the finish line (measured as a straight line from his current location to the finish line)?

(b) If Mario drives in a straight line for the finish line (driving on the grass the whole time), how many seconds does it take for him to reach the finish line?

(c) If Mario first drives the five units straight toward the road first and then drives the 10 units to the finish line, how many seconds does it take for him to reach the finish line?

Suppose instead that Mario drives diagonally towards the road, and then continues along the road to the finish line, as shown below. Let $x$ be the distance that he travels on the road (as indicated in the picture).
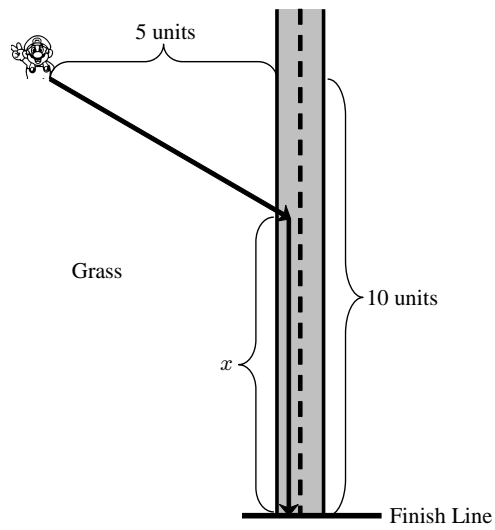


(d) Suppose that $x = 3$.

  i. What is the length of the diagonal path that Mario takes to the road.

  ii. How many seconds does it take for Mario to reach the finish line?

(e) Find a formula for the length of the diagonal path that Mario takes to the road (in terms of $x$).

(f) How many seconds does it take for Mario to reach the finish line (in terms of $x$)?

(g) Sketch a graph of the function from part (f).