1. Part (2) can fail if the initial heading is off by a non-trivial amount. An incorrect initial heading can lead to progressively worse position deviation depending on the distance between the start position and the end position. A 1 degree heading error will case an 8cm position deviation over a distance of .5 m
2. The position error allows us to determine the distance between the robot’s current position and the goal position. This is used to determine how far the robot needs to travel.
3. The heading error is the angle between the robot’s initial heading and the heading required to reach the target coordinate. We use the heading error to rotate the robot around a point until it is facing the target position.
4. Bearing error is used to determine the direction that the robot should be facing once it reaches its final position.
5. We used the values for the controller gains and used used the inverse kinematics to solve for the direction we wanted to go.
6. No, We had a problem with the controller gain not allowing the robot to reach the destination and spun around in circles.
7. theta\_r = p\_2\*bearing\_error + p\_3\*heading\_error  
    x\_r = p\_1\*pos\_error
8. p\_1 = It changes how far you go for every tick. P\_2 = how much you deviate from a specific direction. P\_3 = how fast you point towards the direction you are trying to achieve
9. If you increase these values too much then sparki will have a very difficult time trying to get to the final destination and might spin around in circles or miss the point completely
10. In the current configuration, the robot would collide with any obstacle between it and its goal position.
11. A solution could be using the ultrasonic sensor until it reaches an object within a certain distance lets say x. Then you could make the robot turn until the object is not longer in front. Once it is not in front you make it move forward a distance of x and then recalculate how to get to the goal.
12. If the u shape is wide enough to force the sparki inside of the u then it would have to turn around and take a really long route around the U.
13. ByteMe
14. We spent around 7 hours coding this. Both lab periods along with a few hours outside of lab.