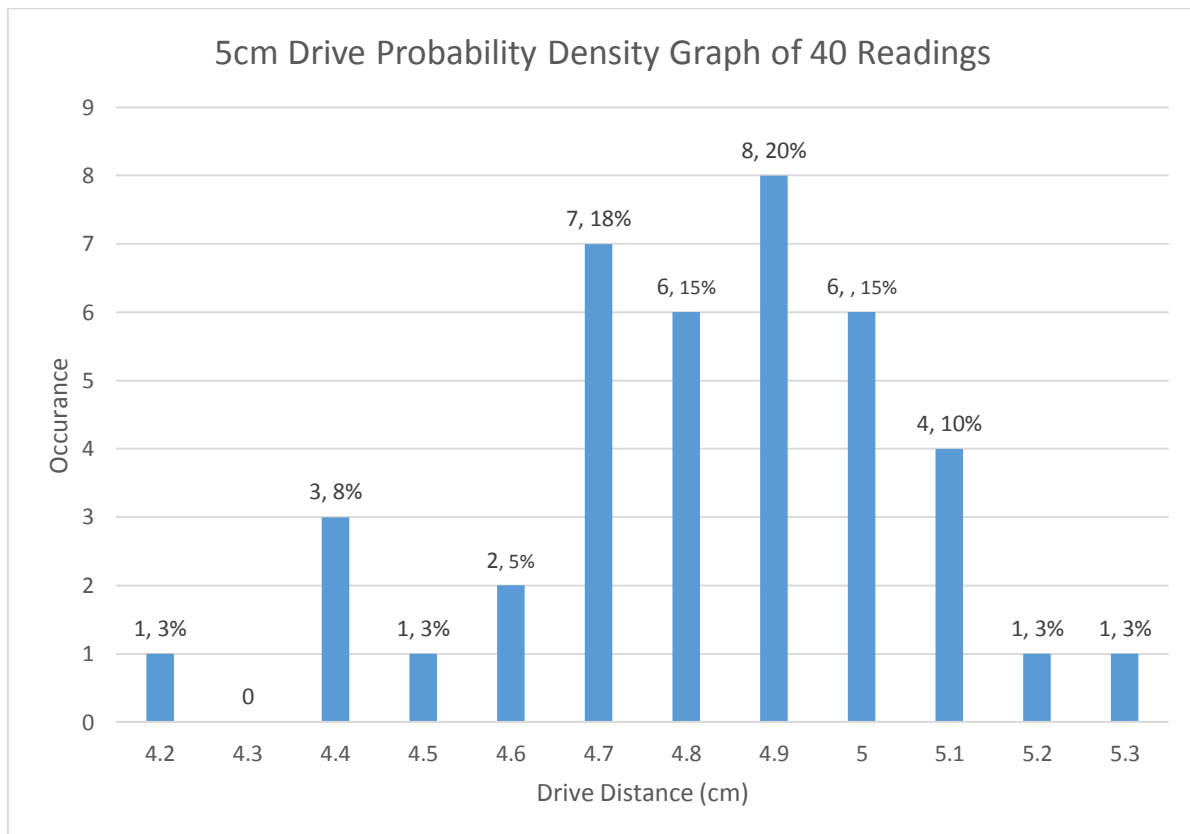Part A) Compute the discrete probability density function for driving the robot forward 5cm. For the continuous function, fit the discrete case to a piecewise linear function. As seen below, the following density graph displays 40 samples of 5cm drive commands. The probability of driving to a position x and the occurrence is labeled. The piecewise function below reflects the density graph.

5cm Drive Probability Density Graph of 40 Readings

p(Δx=d+b)=
0.03 for [4.1, 4.3]
0.00 for [4.2, 4.4]
0.08 for [4.3, 4.5]
0.03 for [4.4, 4.6]
0.05 for [4.5, 4.7]
0.18 for [4.6, 4.8]
0.15 for [4.7, 4.9]
0.20 for [4.8, 5.0]
0.15 for [4.9, 5.1]
0.10 for [5.0, 5.2]
0.03 for [5.1, 5.3]
0.03 for [5.2, 5.4]
0 otherwise

Part B) Compute the discrete probability density function for the front sensor measuring a distance of 25cm, 20cm, 15cm and 10cm.

25cm Sensor Discrete Probability Density Graph of 20 Readings

Bar chart. X-axis: Sensor Digital Output (20, 21, 22, 23). Y-axis: Occurance (0 to 8).
- 20: 1, 5%
- 21: 7, 35%
- 22: 6, 30%
- 23: 6, 30%

20cm Sensor Discrete Probability Density Graph of 20 Readings

Bar chart. X-axis: Sensor Digital Output (26, 27, 28). Y-axis: Occurance (0 to 16).
- 26: 1, 5%
- 27: 15, 75%
- 28: 4, 20%

15cm Sensor Discrete Probability Density Graph of 20 Readings

10cm Sensor Discrete Probability Density Graph of 20 Readings