In [1]:
```
#Q2)
import math
def comp_speed(density):
    k = float(density)
    a = math.log(157/k)
    Greenshields_Model = round(65.1*(1-0.0075*k),3)
    Greenberg_Model = round(62.1*a,3)
    return Greenshields_Model, Greenberg_Model
def permutations():
    list_b = [43,50,80,31]
    for numbers in list_b:
        print(comp_speed(numbers))
permutations()
```

```
(44.105, 80.422)
(40.688, 71.056)
(26.04, 41.869)
(49.964, 100.742)
```

In [3]:
```
def main():
    print("max average speed is ", truck_average_speed([560, 440, 490, 530, 370], [10.3, 10.3, 9.1, 10.1, 7.5]))

def truck_average_speed(distances, times):
    average_speeds = []
    print("length of distances is ", len(distances))
    for i in range(len(distances)):
        print("iteration = ", i)
        print("distance is ", distances[i])
        print("time is ", times[i])
        average_speeds.append(round(float(distances[i]/times[i]), 2))
        print("average speed is ", average_speeds[i])
    return max(average_speeds)

main()
```

```
length of distances is  5
iteration =  0
distance is  560
time is  10.3
average speed is  54.37
iteration =  1
distance is  440
time is  10.3
average speed is  42.72
iteration =  2
distance is  490
time is  9.1
average speed is  53.85
iteration =  3
distance is  530
time is  10.1
average speed is  52.48
iteration =  4
distance is  370
time is  7.5
average speed is  49.33
max average speed is  54.37
```

In [2]:
```
import matplotlib.pyplot as plt
import seaborn as sns
import pandas as pd
import numpy as np
```

In [3]:
```
import pandas as pd
df = pd.read_csv("http://cee.eng.usf.edu/faculty/flm/CGN6933/TTE6307-MID(21).txt",
 delimiter = "\t", header=None
 )
dxf = df.iloc[:,[24,22, 29, 30, 20]]
dxf.columns = ['Age', 'Gender', 'Home', 'household', 'Use_of_autonomous_vehicles']
```

In [4]:
```
dxf
```

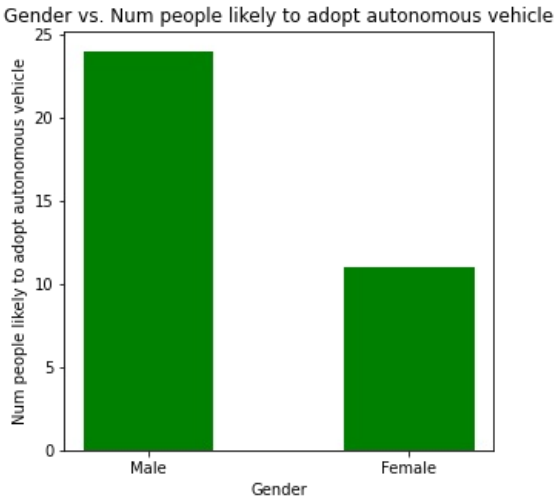
Out[4]:

	Age	Gender	Home	household	Use_of_autonomous_vehicles
0	25	2	2	5	4
1	36	1	1	7	1
2	45	2	1	7	1
3	28	2	1	7	4
4	37	1	1	8	2
...	...	...	...	...	...
322	25	2	1	1	4
323	38	2	1	7	1
324	29	1	1	7	4
325	58	1	1	10	2
326	59	2	1	10	1

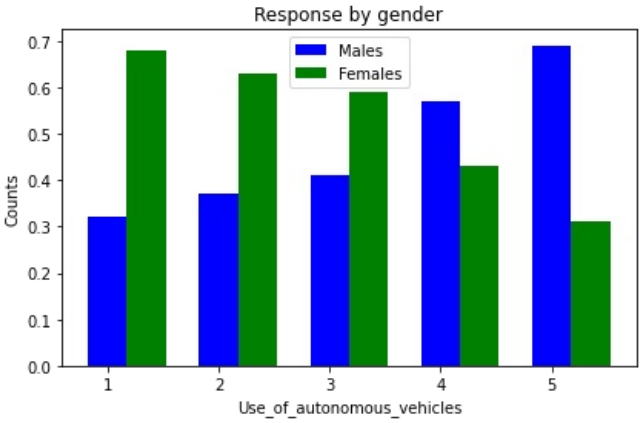
327 rows × 5 columns

In [10]:
```
#Which gender group is extremely more likely to adopt the autonomous vehicle?
dxf_gender_autonomous = dxf[["Gender", "Use_of_autonomous_vehicles"]]
dxf_gender_autonomous_likely = dxf_gender_autonomous[dxf_gender_autonomous.Use_of_autonomous_vehicles == 5]
dxf_a = dxf_gender_autonomous_likely.groupby(['Gender']).size().sort_values(ascending=False).reset_index(name='
dxf_a = dxf_a.replace(1, "Female").replace(2, "Male")
print(dxf_a)

fig = plt.figure(figsize = (5, 5))
# creating the bar plot
plt.bar(dxf_a["Gender"], dxf_a["count"], color ='green', width = 0.5)
plt.xlabel("Gender")
plt.ylabel("Num people likely to adopt autonomous vehicle")
plt.title("Gender vs. Num people likely to adopt autonomous vehicle")
plt.show()
```

```
   Gender  count
0    Male     24
1  Female     11
```

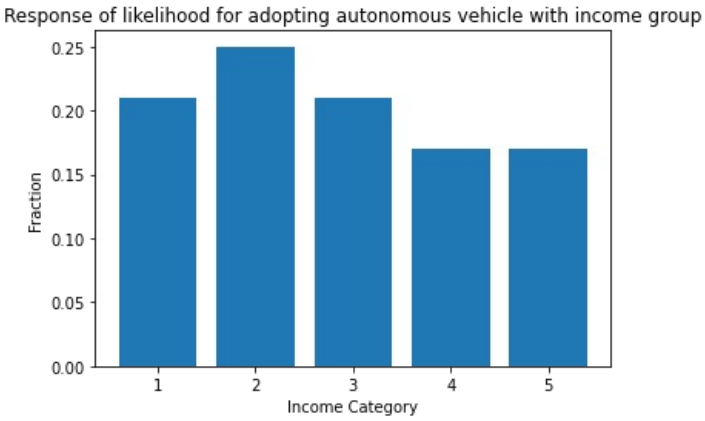


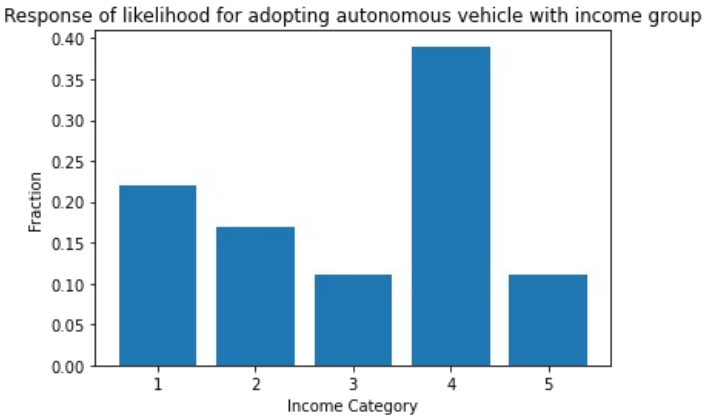
In [6]:
```
m_resp=[]
f_resp=[]
resps = np.unique(dxf['Use_of_autonomous_vehicles'])
for ctr in resps:
    dftemp = dxf.iloc[np.where(dxf['Use_of_autonomous_vehicles']==ctr)]
    m_frac = round(len(np.where(dftemp['Gender']==2)[0])/len(dftemp['Gender']),2)
    m_resp.append(m_frac)
    f_frac = round(len(np.where(dftemp['Gender']==1)[0])/len(dftemp['Gender']),2)
    f_resp.append(f_frac)

n_grps = len(resps)
index = np.arange(1,n_grps+1)
bar_width=0.35
males_bar = plt.bar(index, m_resp, bar_width,color='b',label='Males')
fem_bar = plt.bar(index+bar_width, f_resp,bar_width, color='g', label='Females')

plt.xlabel('Use_of_autonomous_vehicles')
plt.ylabel('Counts')
plt.title('Response by gender')
plt.tight_layout()
plt.legend()
plt.show()
```



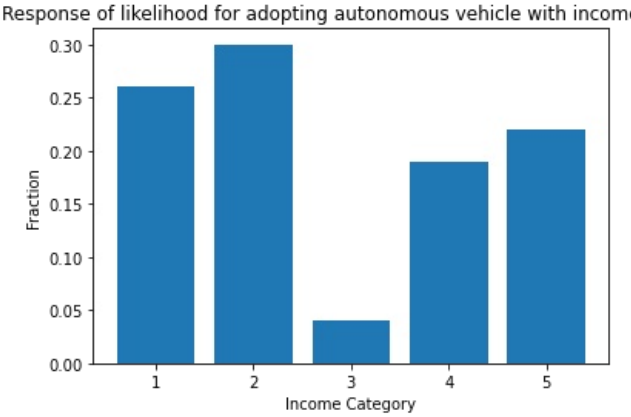
In [ ]:
```
#The above plot shows that males(blue bar) are more likely to
#adopt autonomous vehicle
```

In [7]:
```
income_cat = np.unique(dxf['household'])
resps = np.unique(dxf['Use_of_autonomous_vehicles'])
final_resp=[]
for ctr1 in income_cat:
    dftemp = dxf.iloc[np.where(dxf['household']==ctr1)]
    x=[]
    for ctr2 in resps:
        val1 = round(len(np.where(dftemp['Use_of_autonomous_vehicles']==ctr2)[0])/len(dftemp['Use_of_autonomous
        x.append(val1)
    plt.bar(range(1,6),x)
    plt.xlabel('Income Category')
    plt.ylabel('Fraction')
    plt.title('Response of likelihood for adopting autonomous vehicle with income group')
    plt.show()
```

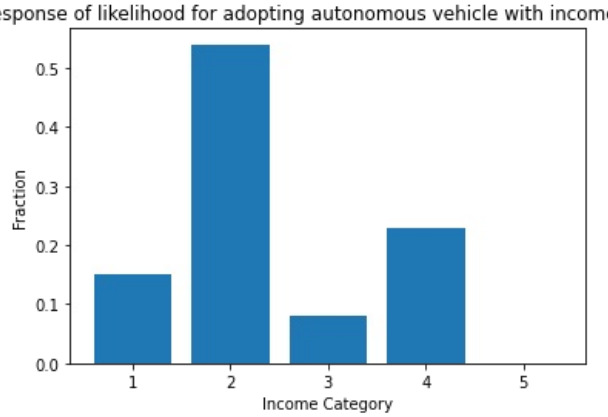




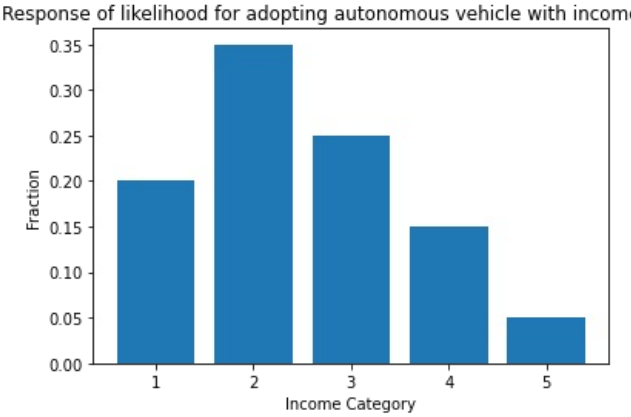
Response of likelihood for adopting autonomous vehicle with income group



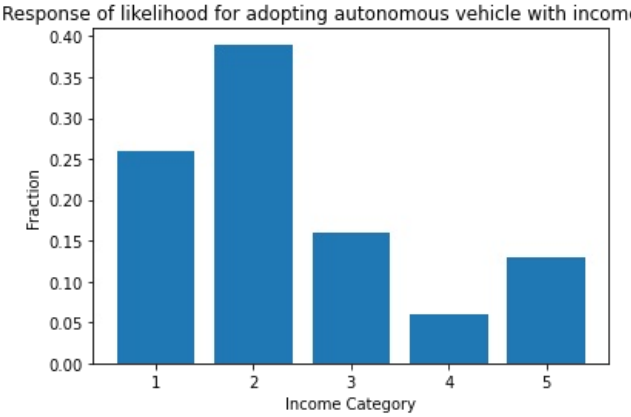
Response of likelihood for adopting autonomous vehicle with income group

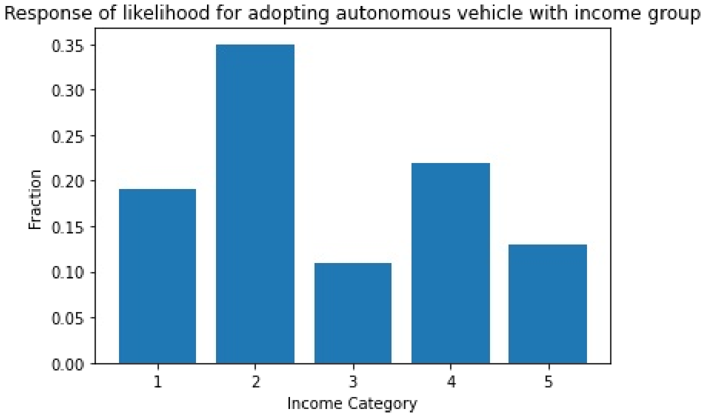


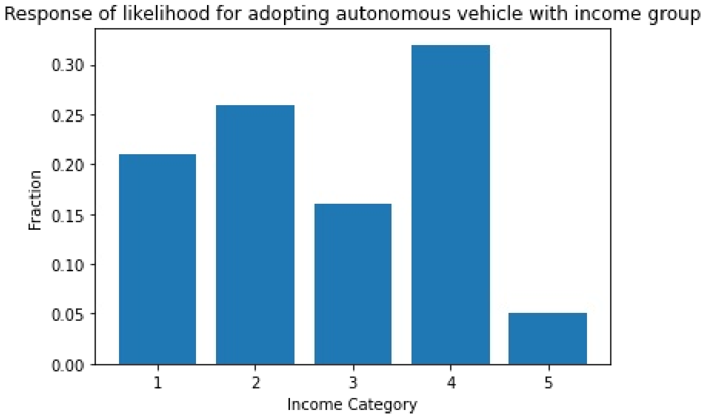
Response of likelihood for adopting autonomous vehicle with income group

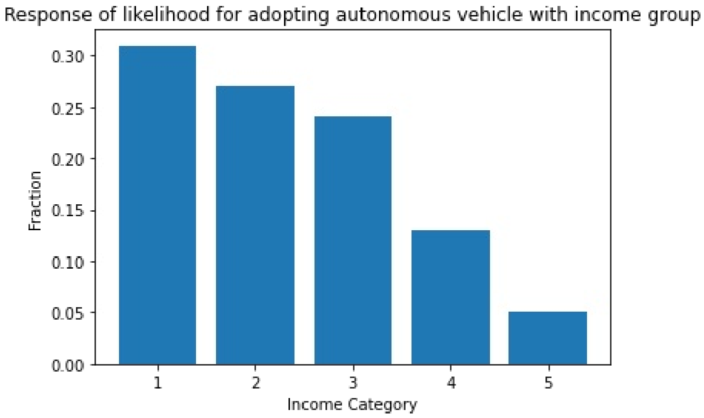


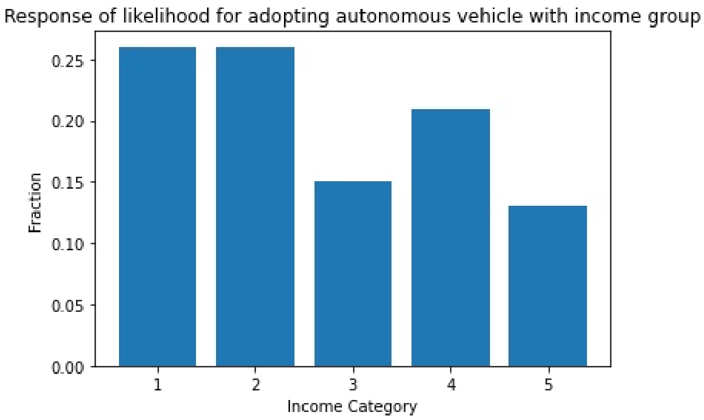
Response of likelihood for adopting autonomous vehicle with income group





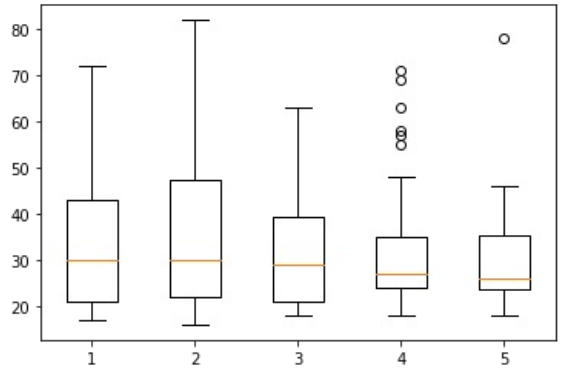






In [10]:
```
#bar graphs for different income categories. We establish a relationship that as income increases the fraction
#vehicles is decreasing.
```

In [9]:
```
age = []
resps = np.unique(dxf['Use_of_autonomous_vehicles'])
for ctr in resps:
    dftemp = dxf.iloc[np.where(dxf['Use_of_autonomous_vehicles']==ctr)]
    age.append(dftemp['Age'])
plt.boxplot(age)
plt.show()
```



In [ ]:
```
#The younger generation is more likely to adopt the autonomous vechicle as comapared
#to older one as in the boxplot the yellow line(median) is sloping downwards.
```