Gregory Campbell

Exercise 1:

Average of product characteristics:

```
  PPk_Stk    PBB_Stk    PFl_Stk  PHse_Stk  PGen_Stk  PImp_Stk    PSS_Tub    PPk_Tub    PFl_Tub  PHse_Tub
0.5184362  0.5432103  1.0150201 0.4371477 0.3452819 0.7807785  0.8250895  1.0774094  1.1893758 0.5686734
```

Standard deviation of product characteristics:

```
   PPk_Stk     PBB_Stk     PFl_Stk   PHse_Stk   PGen_Stk   PImp_Stk     PSS_Tub     PPk_Tub     PFl_Tub  PHse_Tub
0.15051740  0.12033186  0.04289519 0.11883123 0.03516605 0.11464607  0.06121159  0.02972613  0.01405451 0.07245500
```

Market Share (in percents):

```
        1          2          3          4          5          6          7          8          9         10
39.507830 15.637584   5.436242 13.266219   7.046980   1.655481   7.136465   4.541387   5.033557   0.738255
```

Note that 1 indicates product 1 (PPk_Stk), 2 indicates product 2 (PBB_Stk), etc.

Market Share of products whose price is below mean (in percents):

```
         1          2          4          5          6          7         10
50.2418208 19.8862020 16.8705548  8.9615932  1.1095306  1.9914651  0.9388336
```

Market Share of products whose price is above mean (in percents):

```
        3          6          7          8          9
25.445026   3.664921 26.073298 21.256545 23.560209
```

Mapping between observed attributes and choices:

Low-income households (in percents):

1	2	3	4	5	6	7	8	9	10
39.9152542	16.3983051	4.8728814	14.6186441	8.1355932	0.7627119	7.5423729	2.9661017	4.1949153	0.5932203

Medium-income households (in percents):

1	2	3	4	5	6	7	8	9	10
41.448468	14.874652	6.128134	11.086351	6.016713	2.674095	6.740947	4.902507	5.125348	1.002786

High-income households (in percents):

1	2	3	4	5	6	7	8	9	10
25.3968254	14.2857143	5.7142857	15.5555556	4.7619048	2.5396825	6.3492063	14.2857143	10.7936508	0.3174603

College graduates:

1	2	3	4	5	6	7	8	9	10
39.674682	15.487977	7.779349	12.305516	6.082037	2.263083	7.284300	3.677511	4.384724	1.060820

Did not graduate from college:

1	2	3	4	5	6	7	8	9	10
39.4306283	15.7068063	4.3520942	13.7107330	7.4934555	1.3743455	7.0680628	4.9410995	5.3337696	0.5890052

Retired:

```
          1          2          3          4          5          6          7          8          9         10
36.4389234 17.3913043 13.3540373  9.4202899  4.7619048  2.8985507  4.8654244  2.0703934  8.3850932  0.4140787
```

Family size less than 3:

```
          1          2          3          4          5          6          7          8          9         10
37.0238095 15.5357143  9.5833333 10.5357143  3.8690476  1.9642857  8.4523810  4.1666667  8.6904762  0.1785714
```

Family size of 3 or 4:

```
          1          2          3          4          5          6          7          8          9         10
41.2625801 16.4684355  2.8362306 13.6322049  8.5544373  0.8234218  7.1820677  5.5809698  3.1107045  0.5489478
```

Family size of 5 or more:

```
          1          2          3          4          5          6          7          8          9         10
40.066225  12.913907   3.311258 19.536424  10.430464   3.807947   3.311258   1.821192   1.821192   2.980132
```

Exercise 2:

Estimated parameters:

```
 [1] -0.9543068  1.2969677 -1.7173323 -2.9040047 -1.5153115  0.2517680  1.4648677  2.3575041 -3.8965933
[10] -6.6565784
```

Coefficient estimate for price:

```
[1] -6.656578
```

For optimization and interpretation, see code.

Exercise 3:

Beta estimates for family income:

```
[1] -0.001750137  0.024167789  0.001781635 -0.008171016  0.033891281 -0.004458538  0.028911962  0.030483107
[9] -3.611081569
```

For optimization and interpretation, see code.

Exercise 4:

Conditional logit marginal effects:

```
 [1] -1.28526721  0.29536989  0.12071093  0.29508347  0.15622709  0.03732050  0.15359654  0.09929462  0.11082077
[10]  0.01684340
```

Multinomial marginal effects:

Income:

```
[1] -1.403947e-03 -8.503491e-04  9.755901e-04 -1.838371e-04 -7.745915e-04  4.649255e-04 -5.766467e-04
[8]  1.114613e-03  1.235336e-03 -1.092789e-06
```

Whitecollar:

```
[1] -3.196782e-02 -1.685811e-02  2.744240e-02 -7.111310e-03  4.507271e-02 -4.527605e-04 -1.165787e-02
[8] -1.972419e-02  1.525673e-02  2.205414e-07
```

College:

```
[1]  2.025524e-02  1.221154e-02  3.271138e-02 -1.864835e-02 -2.583939e-02  5.133028e-03  8.851954e-03
[8] -2.003059e-02 -1.464495e-02  1.404424e-07
```

Retired:

```
[1] -2.942281e-02  1.926110e-02  8.294617e-02 -2.048099e-02  1.499868e-02  2.064612e-02 -5.758186e-02
[8] -5.300869e-02  2.264251e-02 -2.287607e-07
```

Family Size:

```
[1]  1.402879e-02  4.487689e-03 -1.613545e-02  2.509298e-02  2.299616e-02  1.444748e-03 -1.503662e-02
[8] -8.373697e-03 -2.850480e-02  2.081221e-07
```

Exercise 5:

See code for model optimization and interpretation.

Mtt value I found:

```
[1] -91150.76
```