2. Data Exercise

a. The estimated effect on the probability of arrest if *pcnv* goes from 0.25 to 0.75?

```
                Estimate  Std. Error t value  Pr(>|t|)
pcnv        -0.15438020  0.02093356 -7.3748 2.175e-13 ***
```

According to the regression result, if *pcnv* goes from 0.25 to 0.75 (a 0.5 increase), the probability of being arrested will decrease by 0.0772, which is 7.72%.

b. Test the joint significance of *avgsen* and *tottime.*

Nonrobust result

Chi-squared test:

X2 = 0.36, df = 2, P(> X2) = 0.84

Robust result

Chi-squared test:

X2 = 0.37, df = 2, P(> X2) = 0.83

Both results show that we failed to reject the null

c. Now estimate the model by probit.

-0.1017193 means that the probability falls by about 10.17% when *pcnv* goes from 0.25 to 0.75. This is greater than what we've obtained in part a which is 7.72%

d. Obtain the percent correctly predicted.

predictedarr	0	1
0	1919	697
1	51	58

Percent correctly predicted when narr86 = 0 is 1919/(1919+51) = 0.9741 = 97.41%

Percent correctly predicted when narr86 = 1 is 58/(697+58) = 0.0768 = 7.68%

Percent correctly predicted overall is (1919+58)/2725 = 0.7255 = 72.55%

The model did a decent job on predicting the number of men not arrested but it underestimated the number of arrests.

e. Add the quadratic terms to the model and test for individual/joint significance

Individual test result

	Estimate	Std. Error	z value	Pr(>|z|)
pcnv	7.5977e-02	8.0340e-02	0.9457	0.344307

pcnvsq   -2.4569e-01 8.1258e-02 -3.0235 0.002499 **

pt86sq   -1.3998e-02 2.0109e-03 -6.9611 3.375e-12 ***

inc86sq   3.3106e-06 1.0914e-06 3.0332 0.002419 **

The test shows that all three quadratic terms are individually significant

Joint test result

Chi-squared test:

X2 = 71.9, df = 3, P(> X2) = 1.7e-15

The test shows that the three quadratic terms are jointly statistically significant.

The coefficient on *pcnv* is positive and the coefficient on pcnvsq is negative indicating that initially there is a positive relationship between the probability of arrest and *pcnv* and then the relationship goes negative. The turning point is .217/(2(.857)) ≈.127