## Question 3.

1. We will find MLE for :

We have for each {x1, x2, …,xn} therefor:

One can see that the leading constant does not affect the value of that maximizes the likelihood, so we just ignore it:

Let us now derive this function and find for which values of p it is equal to zero:

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## Question 4.

Pearson's correlation coefficient is simply this ratio:

We will prove that and therefor.

The variance is non-negative for both X and Y by definition and so. If X and Y are independent then, because:

Using *Cauchy-Schwarz inequality* we get:

Thus we get that and therefor.