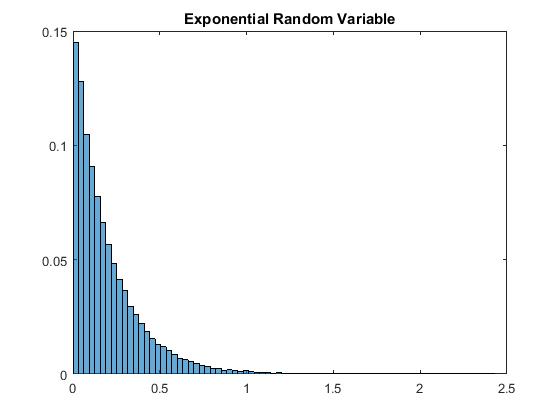
# Lab 3

## Question 1



## Question 2

## C:\Users\Cameron\School\4005\Lab3\tes1.jpg

Figure Histogram for a=-0.1

## C:\Users\Cameron\School\4005\Lab3\tes2.jpg

Figure Histogram for a=-0.01

## Question 3

|  |  |  |
| --- | --- | --- |
| Expected | Observed | Chi-Squared |
| 2467 | 2446 | 0.178759627 |
| 2406.1 | 2347 | 1.451647895 |
| 2346.7 | 2219 | 6.949030554 |
| 2288.8 | 2145 | 9.034620762 |
| 2232.4 | 2155 | 2.683551335 |
| 2177.3 | 2183 | 0.014922151 |
| 2123.6 | 2072 | 1.253795442 |
| 2071.2 | 1999 | 2.516821166 |
| 2020.1 | 1998 | 0.24177516 |
| 1970.3 | 1992 | 0.238994062 |
|  |  |  |

For the uncorrelated numbers, the chi-squared value is 313.7992**,** which is less than the critical value of 318.9581. The hypothesis of an exponential distribution is accepted.

|  |  |  |
| --- | --- | --- |
| Expected | Observed | Chi-Squared |
| 2531.4 | 2618 | 2.962613574 |
| 2467.4 | 2569 | 4.183577855 |
| 2404.9 | 2507 | 4.334654248 |
| 2344 | 2373 | 0.358788396 |
| 2284.7 | 2332 | 0.979248917 |
| 2226.9 | 2252 | 0.282908977 |
| 2170.5 | 2212 | 0.793480765 |
| 2115.5 | 2197 | 3.139801465 |
| 2062 | 2108 | 1.026188167 |
| 2009.8 | 2031 | 0.223624241 |

For the correlated numbers with a=0.1, the chi-squared value 464.8039, which is greater than the critical value 312.5377. The hypothesis of an exponential distribution is rejected.

|  |  |  |
| --- | --- | --- |
| Expected | Observed | Chi-Squared |
| 2467 | 3934 | 872.3506283 |
| 2406.1 | 3720 | 717.4819043 |
| 2346.7 | 3702 | 782.7323859 |
| 2288.8 | 3145 | 320.2894268 |
| 2232.4 | 3018 | 276.4591292 |
| 2177.3 | 3008 | 316.9349607 |
| 2123.6 | 2586 | 100.6845734 |
| 2071.2 | 2294 | 23.96670529 |
| 2020.1 | 1984 | 0.645121529 |
| 1970.3 | 1831 | 9.848495153 |

For the second set of correlated numbers with a = 0.01, the chi-squared value 6871.9183, which is greater than the critical value 323.2359. The hypothesis of an exponential distribution is rejected.

## Question 4

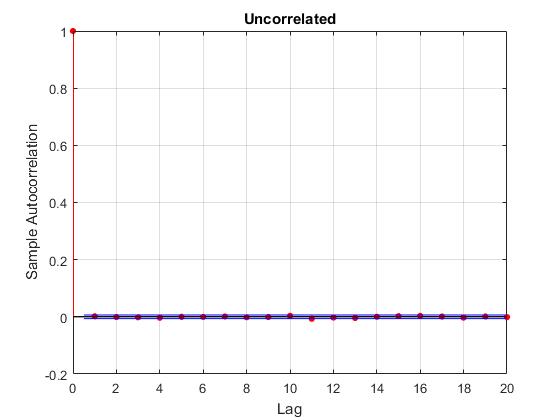
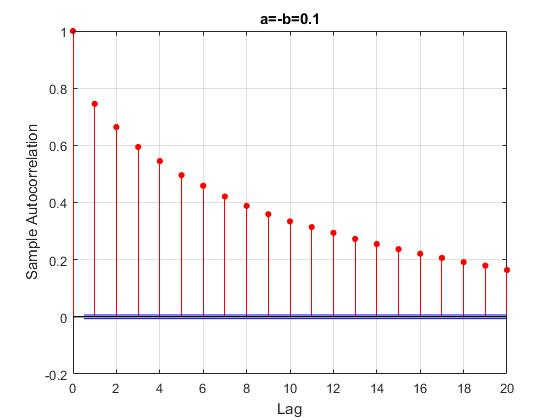
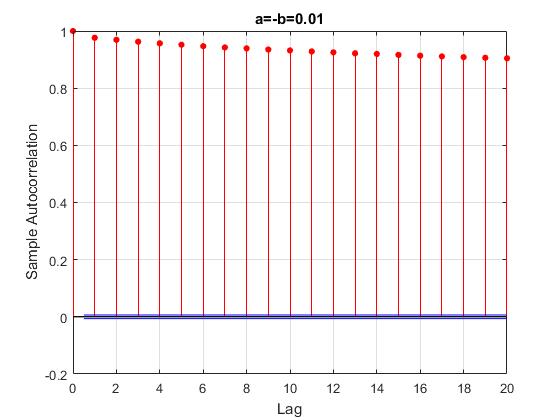


Figure Autocorrelation plot for uncorrelated exponential random variable

The autocorrelation plot suggests that the random numbers are indeed independent.



This plot suggests that a correlation does exist between the randomly generated numbers.



This plot suggests that there is a strong correlation between the randomly generated numbers.