# course_project_part1

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In this exercise exponential distribution `rexp(n, lambda)` will be simulated. We set `lambda = 0.2`. The mean and standart deviation of exponential distribution is `1/lambda`. In this exerscise we investigate distribution of averages of 40 exponentials.

```
set.seed(100)
lambda <- 0.2
number_of_simulations <- 1000
sample_size <- 40
simulations <- replicate(number_of_simulations, rexp(sample_size, lambda))
```

`simulations` is sample of iids. Let's check mean of this samples and the mean of the means:

```
simulation_means <- colMeans(simulations)
total_mean <- mean(simulation_means)
total_mean
```

```
## [1] 4.999702
```

According to theory mean should be

```
analytical_mean <- 1/lambda
analytical_mean
```

```
## [1] 5
```

Lets check standart deviation. Standart deviation for simulation results will be:

```
simulation_standart_deviation <- sd(simulation_means)
simulation_standart_deviation
```

```
## [1] 0.8020251
```

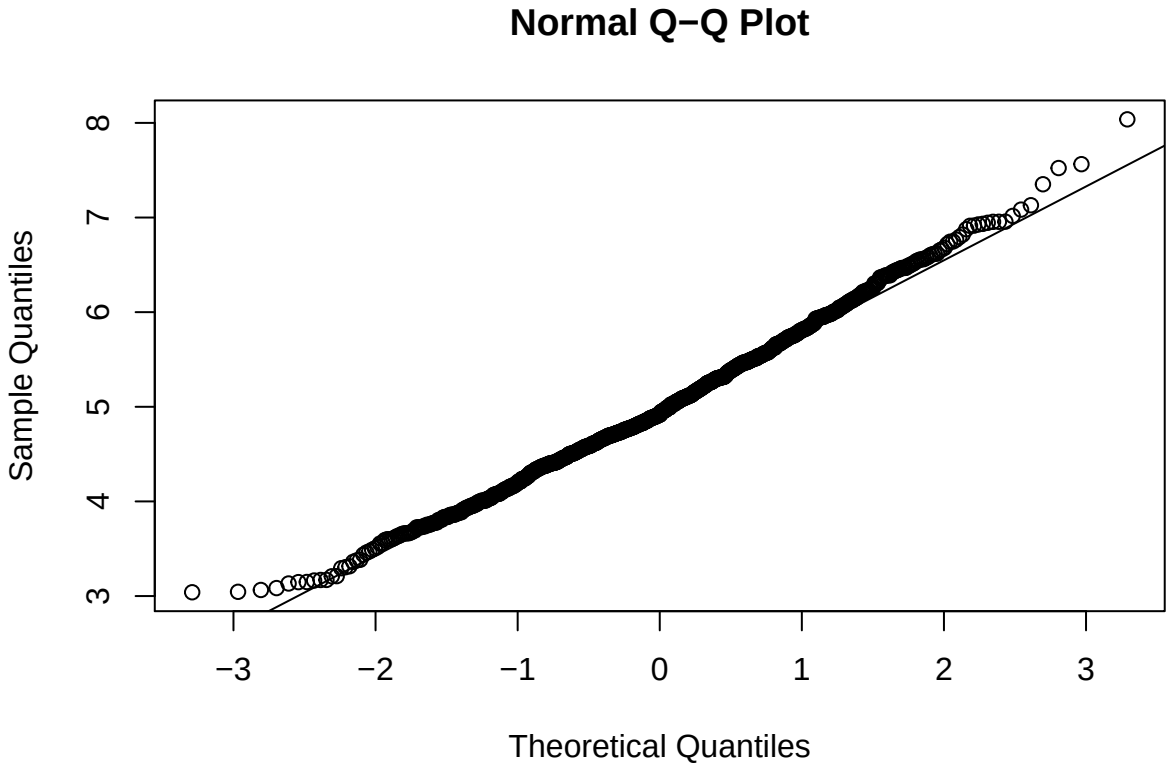
Standart deviation for analytical results will be:

```
analytic_standart_deviation <- (1/lambda) * 1/sqrt(sample_size)
analytic_standart_deviation
```

```
## [1] 0.7905694
```

So we can say that theoretical mean concurs simulation mean and theoretical standart deviation occurs simulation standart deviation.

According to CLT distribution of means exponentials should be close to normal. We will demonstrate it using q-q plots.


Normal Q−Q Plot
Sample Quantiles
Theoretical Quantiles
3
4
5
6
7
8
−3
−2
−1
0
1
2
3