

Q2-2

```
iteration <- 10000
lambda0 <- 1
sample_size <- 20
test_size <- 0.05
critical_value <- abs(qnorm(test_size/2))
count <- 0

for (i in 1:iteration) {
  sample <- rpois(sample_size, lambda0)
  W <- (sum(sample) - sample_size * lambda0) / sqrt(sum(sample))
  if (abs(W) > critical_value) {
    count <- count + 1
  }
}

type_one_err <- count / iteration

> print(type_one_err)
[1] 0.0509
```

Under the condition that $\lambda_0 = 1$, sample size = 5, X_1, X_2, \dots, X_{20} from $Poisson(\lambda_0)$ and $\alpha = 0.05$, I iterated the Wald test for ten thousand times.

There are 509 cases when test statistic $W = \frac{\sum_{i=1}^{20} x_i - n\lambda_0}{\sqrt{\sum_{i=1}^{20} x_i}}$ is greater than $Z_{\frac{\alpha}{2}}$, i.e. rejected the null hypothesis.

The type one error is $P_{H_0}(\text{reject the null}) = 0.0509$ which is close to the size α .