

STAT 201B HW4

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Question 1 - optional part b

```
import numpy as np
from scipy.stats import norm

# parameters
lam0 = 1
n = 20
alpha = 0.05
B = 1000
z_crit = norm.ppf(1 - alpha/2)

# simulation
np.random.seed(0)
rejects = 0
for _ in range(B):
    x = np.random.poisson(lam0, n)
    xbar = np.mean(x)
    T = np.sqrt(n) * (xbar - lam0) / np.sqrt(xbar)
    if abs(T) > z_crit:
        rejects += 1

type_I_error = rejects / B
print(f"Estimated Type I error rate: {type_I_error:.3f}")
print(f"out of {B} experiments we reject the null {rejects} times")

print(f"Estimated Type I error rate: {type_I_error:.3f}")
print(f"Difference from 0.05: {type_I_error - 0.05:+.3f}")

if abs(type_I_error - 0.05) < 0.01:
    print("The simulated Type I error rate is very close to 0.05.")
else:
    print("The simulated Type I error rate deviates noticeably from 0.05.")
```

Estimated Type I error rate: 0.047
out of 1000 experiments we reject the null 47 times
Estimated Type I error rate: 0.047
Difference from 0.05: -0.003
The simulated Type I error rate is very close to 0.05.