

Name \_\_\_\_\_

Student Number \_\_\_\_\_

### STA 312 f2023 Quiz 3

Let  $X_1, \dots, X_n$  be a random sample (that is, independent and identically distributed) from a Poisson distribution with parameter  $\lambda > 0$ . You already know that the maximum likelihood estimate is  $\hat{\lambda} = \bar{X}$ . We want to test  $H_0 : \lambda = \lambda_0$  versus  $H_1 : \lambda \neq \lambda_0$  with a large-sample likelihood ratio test. For this problem, the subset of the parameter space specified by the null hypothesis is a single point:  $\Theta_0 = \{\lambda_0\}$ .

1. (7 points) Write down and simplify the  $G^2$  test statistic. A variety of “simplified” answers can be correct. Your final answer is a formula. **Circle it.**

2. (3 points)

(a) A random sample of size  $n = 49$  yields a sample mean of 4.2 and a sample standard deviation of 2.14. We want to test  $H_0 : \lambda = 3$ . Calculate your  $G^2$  statistic from Question 1. Show a little work. The answer is a number. **Circle your answer.**

(b) What are the degrees of freedom? The answer is a number.

(c) The critical chi-squared value at  $\alpha = 0.5$  is  $1.96^2 = 3.84$ . Do you reject  $H_0$ ? Answer Yes or No.