STATISTICS APPLIED TO BUSINESS ADMINISTRATION ACADEMIC YEAR 2024-2025 PRACTICAL EXERCISES 6 AND 7 (40 MINUTES)

Date:

Complete name:

ID number:_____

EXERCISE 1 (10 POINTS)

We wish to test the null hypothesis that the probability density function of a given population is $\gamma(a = 5, r)$, against the alternative hypothesis that it is $\gamma(a = 2, r)$; that is, the parameter r is common to both distributions. We recall that the probability density function for a $\gamma(a, r)$ distribution is given by:

$$f(x;a,r) = \frac{a^r}{\Gamma(r)} x^{r-1} e^{-ax}, \quad x > 0, \ a,r > 0$$

In order to carry out this test, a random sample of size n = 1 has been taken from that population (that is, we observe X). Recall that, when r is an integer, $\Gamma(r) = (r - 1)!$

- 1. (4 points) For this test, find the form of the most powerful critical region for X.
- 2. (3 points) If r = 1 and x = 0.40, what would be the decision at the 0.05 significance level?
- 3. <u>(3 points)</u> What would be the approximate power for this specific case and specific significance level?

EXERCISE 2 (10 POINTS)

A firm wants to sell three types of MP3 devices and, regarding this, it has the following information:

Type	1	2	3
Probabilities	$(1-4\theta)$	2θ	2θ

In order to estimate these probabilities, a random sample of 50 individuals has been taken and has provided the following information: 20 individuals bought type 1 MP3 devices; 20 individuals bought type 2 MP3 devices and 10 individuals bought type 3 MP3 devices. You will need to find the maximum likelihood estimate of θ to be able to test the hypothesis that the probability distribution the firm has is the correct one. You can assume that the significance level is $\alpha = 5\%$. Remember that you should clearly state the type of test you are carrying out, establish the null and alternative hypothesis, provide the test statistic for this test and its corresponding distribution under the null hypothesis, and clearly indicate the rule of rejection and conclusion for this specific test.