STATISTICS APPLIED TO BUSINESS ADMINISTRATION
SEMINAR 5 (1 hour)

Date: _____

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EXERCISE 1 (2 POINTS)

Let X be a r.v. having a uniform distribution on the interval $(\theta, 4)$. In order to test the null hypothesis $H_0 : \theta = 0$ against the alternative hypothesis $H_1 : \theta = 2$, a r.s. of size $n = 1$, X_1, has been taken, and it is decided that the null hypothesis will be rejected if $X_1 > 3.5$.

1. **(1 point)** Compute the significance level for this test.

2. **(1 point)** Compute the power for this test.

EXERCISE 2 (4 POINTS)

Let X be a r.v. with a probability density function given by:

$$f(x, \theta) = \begin{cases} 1 + \theta(x^3 - \frac{1}{4}) & \text{if } x \in (0, 1); \\ 0 & \text{otherwise,} \end{cases}$$

We wish to test the null hypothesis $H_0 : \theta = 1$ against the alternative hypothesis $H_1 : \theta = 0$. In order to do so, a r.s. of size $n = 1$, X_1, has been taken.

1. **(1.5 points)** Find the form of the most powerful critical region for this test and for the test statistic X_1.

2. **(1.25 points)** If the rejection rule is to reject the null hypothesis if $X_1 < 0.1$, compute the significance level for this test.

3. **(1.25 points)** For the rejection rule in the previous item (i.e., item 2), compute the probability of type II error for this test.

EXERCISE 3 (4 POINTS)

A given research focuses on the analysis of the current economic crisis. More specifically, we are interested in analyzing if the size of the firm has an effect on its profits. In order to do so, a r.s. of 600 firms has been taken, and information on the size of the firm (small, medium or large), as well as on its yearly profits for the year 2011 (positive profits or negative profits) was recorded.

	Negative	Positive	Total
Small	84	156	240
Medium	70	130	200
Large	40	120	160
Total	194	406	600

At the $\alpha = 0.05$ significance level and using the available information from the sample, can we state that the firm's yearly resulting profits depend on the size of the firm?

Remark: This piece of paper should be handed in together with your solutions to the aforementioned exercises. You should also write, both on this piece of paper and in the solutions you write, the names of the students in your group that have actively participated in this seminar activity.