Math 4397/6397
Problem Set 8, due Thu, Nov 5, 2009

Problem 1. Consider Problem 1 from Set 7. Test whether or not there was a decline (negative change) in FEV over the 2 year interval of the study. State the appropriate null and alternative hypotheses. Compute the relevant p-value and state assumptions that you make to obtain it.

Problem 2. A possibly larger study evaluates the two-year decline in non-smokers of a different age. Compute which sample size is needed to obtain a power of 0.8 for detecting a change in FEV over two years at least as large as that observed in Problem 1 of Set 7. Use the data in that problem to extract any relevant constants you might need to compute the necessary sample size.

Problem 3. Jason suggests to perform the following simulation in order to support his claim that the p-value can be used as a score: Randomly simulate $10,000$ sample means of size 16 from a normal distribution with mean 5 and variance 1. Calculate $10,000$ test statistics for a test of $H_0 : \mu = 5$ versus $H_a : \mu < 5$. Using these test statistics calculate the $10,000$ p-values for these tests. Plot a histogram of the p-values. Comment on what you observe about the histogram, and explain how you would retain or reject the null hypothesis in your tests based on p-values, in order to achieve a given probability α of type I errors.

Problem 4. **Only for students enrolled in Math6397.** In teams of two students, work out the solution to Project 1, posted on the course webpage.