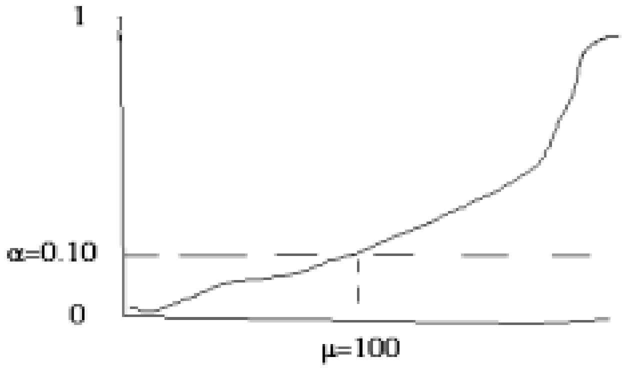
Statistics 515 - Fall 2002 - Exam 3 Solutions

1**a) The mean of the errors is zero at each x**
b) The errors are normal at each x
c) The variance of the errors is constant across x values
d) The errors are independent

2) **The p-value is the probability of observing a statistic at least as extreme as the one observed if the null hypothesis is true.**

3) Power can be increased by **increasing** the sample size or by **increasing** the α-level.

4)



5) If you knew nothing else about the student, regression to the mean would imply that they would score **lower** if they retook the test. A student scoring a 500 out of 800 (near the average) would score **about the same** if they retook it.

6) **4 (the number of treatment df + 1)**

7) **H_0: $\mu_1=\mu_2=\mu_3=\mu_4=\mu_5$ H_A: at least two means differ**

8) r = -0.75 **b** r = 0.0 **c and d** r = 0.75 **a**

1a) **Increase by 1.9018 degrees (look at the slope)**
b) **p-value is less than 0.0001, so we reject the null hypothesis.**
c) **square root of the MSE = 0.4440 degrees.**
d) **R-squared = 0.9944 = 99.44%**
e) **The curve in the residual vs. predicted plot shows us that the mean does not appear to be zero at each x value (maybe caused by the outlier).**

2a)

Source	SS	DF	MS	F	Prob>F
Regression	2053.64	1	**2053.64**	**96.55**	<0.001
Error	**276.57**	13	**21.27**		
Total	2330.21	**14**			

b) Determine the estimated regression equation.
slope = SSxy/SSxx = 62.46/1.90=32.88
intercept = average y - slope * average x =36.94-(32.88)(1.49)=-12.06
so, **y = -12.06+ 32.88 x**

c) the total df = n-1 = 14 and the error df = n-2 = 13, so n, the original sample size, is **15**.

d) Determine a 90% interval for the slope β_1.

α=0.10, α/2=0.05, and df=13 so t= 1.771
32.88 ± 1.771 * sqrt(21.27)/sqrt(1.90)
32.88 ± 5.93 **or (26.95,38.81)**