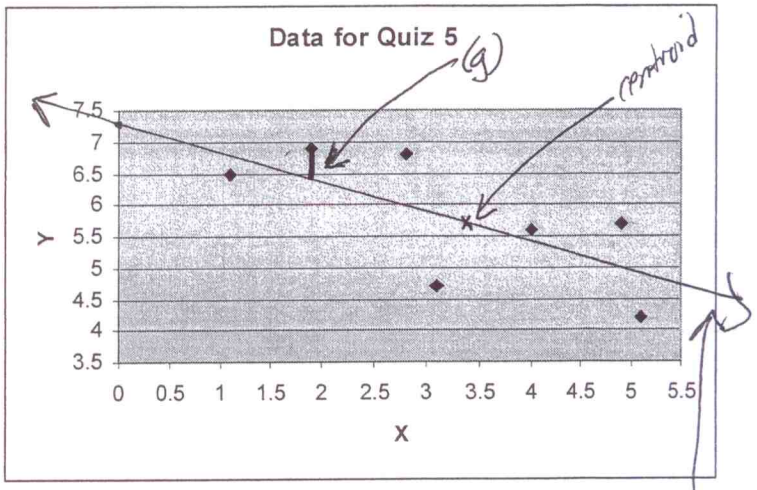
Pledge:

10/29/04 MATH 271 - Applied Stats Name: Solution
Dr. Lunsford Quiz 5 (20 points possible)

You may use your calculator, Excel, the formula sheet given to you in class, any formulas I write on the board, and/or the tables in the back of your textbook for this quiz. Please show all specified work.

To the right you are given (X, Y) sample data (from a bivariate normal distribution) and a scatterplot of the data. Please use this to answer the questions below:

X	Y
1.1	6.5
1.9	6.9
2.8	6.8
3.1	4.7
4	5.6
5.1	4.2
4.9	5.7



(a) Find the centroid of the data and plot it on the graph. (2 points)

$(\bar{x}, \bar{y}) = (3.27, 5.77)$

(b) Find the sample covariance of the data. (2 points)

$Cov(X, Y) = -1.09095 = s_{xy}$

$(s_x = 1.492999,\ s_y = 1.041976)$

$r = \frac{s_{xy}}{s_x s_y}$

(c) Find the sample correlation coefficient of the data. (2 points)

$r = -.7012749811$

(d) Formulate a null and alternative hypothesis (at the $\alpha = 0.05$ level) to test if there is a significant negative correlation between the two variables. Clearly indicate your hypotheses, what you are using for your test statistic, the value of the test statistic, the p-value of the test, and your conclusion. (6 points)

$H_0: \rho \neq 0$, $H_a: \rho < 0$ (claim). $t = r\sqrt{\frac{n-2}{1-r^2}}$

$t = -2.19963$, $r = -.7012749811$, $p\text{-value} = .0395 < .05 = \alpha$

$\therefore$ Reject H_0 in favor of H_a. The data supports claim that there is a significant negative correlation between the two variables.

(e) Find the equation of the regression line for the data and accurately plot it on the graph above. (4 points)

$\hat{y} = -.4894x + 7.373$

(f) Use the regression line to predict y when $x = 3.2$. (1 points)

$\hat{y} = -.4894(3.2) + 7.373 = 5.80692$

(g) What is the magnitude of the residual for the data point (1.9, 6.9)? Represent this value on the graph above. (3 points)

$\hat{y} = -.4894(1.9) + 7.373 = 6.44314$

$|\hat{y} - y| = |6.44314 - 6.9| = .45686$