STAT 464/564 – Homework 0-Review – Due by 10.15 am on Monday, Oct 1

This will be counted as a regular Homework or extra credit as necessary.

First Name: **Last Name:**

You are encouraged to work on this assignment in groups. However, you cannot write exactly same explanations. If I see the exact same explanation on two or more assignments, then I'll give zero points for those assignments.

Show your work for all the questions.

See APPENDIX C in the back of your textbook for supplementary materials related to these questions.

Problem 1:

Let $X_1, X_2, X_3 \sim iid\ N(\mu, \sigma^2)$, and $Z_i = \dfrac{X_i - \mu}{\sigma}$ for $i = 1,2,3$

(a) Specify the probability distribution of Z_i along with the value(s) of parameter(s).

Let $Y_1 = \sum_{i=1}^{3} \left(\dfrac{X_i - \mu}{\sigma}\right)$

(b) Compute the $E(Y_1)$

(c) Compute the $Var(Y_1)$

(d) Specify the probability distribution of Y_1 along with the value(s) of parameter(s).

(e) Specify the probability distribution of Z_i^2 along with the value(s) of parameter(s).

Let $Y_2 = \sum_{i=1}^{3} \left(\dfrac{X_i - \mu}{\sigma}\right)^2$

(f) Specify the probability distribution of Y_2 along with the value(s) of parameter(s).

Problem 2:

Let $X_1, X_2, \ldots X_n \sim iid\ N(0, \sigma^2)$ and $\bar{X} = \dfrac{\sum_{i=1}^{n} X_i}{n}$

(a) Specify the distribution of $\bar{X}$ along with the value(s) of parameter(s).

Let $W \sim \chi^2_{v_1}$ where v_1 is the degrees of freedom, $\bar{X}$ and W are independent.

Consider the new random variable $\dfrac{\bar{X}}{\sqrt{W/v_1}}$

(b) Specify the distribution of new random variable along with the value(s) of parameter(s).

Let $V \sim \chi^2_{v_2}$ where v_2 is the degrees of freedom, V and W are independent.

Consider another new random variable $\dfrac{W/v_1}{V/v_2}$

(c) Specify the distribution of this new random variable and provide value(s) of parameter(s).

Problem 3:

Let $Y|x = a + bx + \varepsilon$, where a, b are constants, $E(\varepsilon) = 0$, and $Var(\varepsilon) = \sigma^2$

(a) Compute the $E(Y|x_0)$

(b) Compute the $Var(Y|x_0)$