

**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  $Z_i = \frac{X_i - \mu}{\sigma}$  for  $i = 1, 2, 3$

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

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

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

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

**Problem 2:**

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

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

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

Consider the new random variable  $\frac{\bar{X}(\sigma/\sqrt{n})}{\sqrt{W/v_1}}$

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

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

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

(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  $Var(Y|x_0)$

**} Same as problem (1) b, c  
( $x_0$  is a constant)**