Name Jerry

Student Number ____________________

STA 431s13 Quiz 1

1. (4 points) Let $\mathbf{X}$ be an n by p matrix with $n \neq p$, and suppose that $(\mathbf{X}'\mathbf{X})^{-1}$ exists. Why is it incorrect to say that $(\mathbf{X}'\mathbf{X})^{-1} = \mathbf{X}^{-1}\mathbf{X}'^{-1}$? You have a lot more room than you need for the answer.

X is not a square matrix, so X^{-1} is not even defined.

$E(g(X)) = \int_{-\infty}^{\infty} g(x)\, f_X(x)\, dx, \quad \text{or } E(g(X)) = \sum_x g(x)\, p_X(x)$

$Var(X) = E[(X - \mu_X)^2] \qquad Cov(X,Y) = E[(X - \mu_X)(Y - \mu_Y)]$

2. (6 points) Let X and Y be random variables. Calculate $Var(X+Y)$ in terms of variances and covariances. You may use the linearity of expected value, but do *not* use the centering rule.

$$E(X+Y) = E(X) + E(Y) = \mu_x + \mu_y$$

$$Var(X+Y) = E\{(X+Y-(\mu_x+\mu_y))^2\}$$

$$= E\{((X-\mu_x)+(Y-\mu_y))^2\}$$

$$= E\{(X-\mu_x)^2 + 2(X-\mu_x)(Y-\mu_y) + (Y-\mu_y)^2\}$$

$$= E\{(X-\mu_x)^2\} + 2E\{(X-\mu_x)(Y-\mu_y)\} + E\{(Y-\mu_y)^2\}$$

$$= Var(X) + 2Cov(X,Y) + Var(Y)$$