Name Jerry

Student Number

STA 302f 2015 Quiz 6

1. (5 points) Let the random vector $\mathbf{y} \sim N_p(\boldsymbol{\mu}, \boldsymbol{\Sigma})$, and $\mathbf{z} = \boldsymbol{\Sigma}^{-1/2}(\mathbf{y} - \boldsymbol{\mu})$. Using moment-generating functions, derive the distribution of the random vector $\mathbf{z}$. Finish your answer with a *clear statement of the distribution of* $\mathbf{z}$.

$$M_{y-\mu}(t) = e^{-t'\mu} M_y(t) = e^{-t'\mu} e^{t'\mu + \frac{1}{2}t'\Sigma t}$$

$$= e^{\frac{1}{2}t'\Sigma t}, \text{ and so}$$

$$M_{\Sigma^{-1/2}(y-\mu)}(t) = M_{y-\mu}(\Sigma^{-1/2}t)$$

$$= e^{\frac{1}{2}(\Sigma^{-1/2}t)'\Sigma(\Sigma^{-1/2}t)}$$

$$= e^{\frac{1}{2}t'\Sigma^{-1/2}\Sigma\Sigma^{-1/2}t} = e^{\frac{1}{2}t'\Sigma^{-1/2}\Sigma\Sigma^{-1/2}t}$$

$$= e^{\frac{1}{2}t'(\Sigma^{-1/2}\Sigma^{1/2})(\Sigma^{1/2}\Sigma^{-1/2})t}$$ OKAY to skip this step

$$= e^{\frac{1}{2}t't}$$

MGF of $N_p(0, I_p)$

2. (5 points) In homework, you used R to estimate the regression coefficients for the `statclass` data.

   (a) Write $\widehat{\beta}_0$, $\widehat{\beta}_1$, $\widehat{\beta}_2$ and $\widehat{\beta}_3$ in the space below. Copy the numbers from your printout.

$\hat{\beta}_0 = 9.14$, $\hat{\beta}_1 = 5.87$, $\hat{\beta}_2 = -2.93$, $\hat{\beta}_4 = 0.32$

   (b) What is the predicted final exam score for a student with a Quiz Average of 8, a Computer Average of 4, and a Midterm score of 90? Show a little work.

$9.14 + (5.87)(8) + (-2.93)(4) + (0.32)(90)$

$= 73.58$

   (c) Circle $\widehat{\beta}_2$ on your printout, and write "$\widehat{\beta}_2$" beside it. Attach the *complete* printout to your quiz Make sure your name and student number are written clearly on the printout.