#1: $Y \sim N(\mu, \sigma^2)$. Show that $X = aY + b \sim N(a\mu + b, a^2\sigma^2)$

#2: Find the value of

(a) $P(|Y-\mu| \leq 2\sigma)$

(b) $P(|Y-\mu| \leq 3\sigma)$

$Y \sim N(\mu, \sigma^2)$

#3: $Y \sim Gamma(\alpha, \beta)$, i.e. $f_Y(y) = \dfrac{y^{\alpha-1} e^{-y/\beta}}{\beta^\alpha \Gamma(\alpha)}$, $0 \leq y < \infty$, $\alpha > 0, \beta > 0$

(a) If k is any positive or negative value such that $\alpha + k > 0$, show that $E(Y^k) = \dfrac{\beta^k \Gamma(\alpha + k)}{\Gamma(\alpha)}$.

(b) Why do we need $\alpha + k > 0$?

(c) Show that, with $k=1$, $E(Y) = \alpha\beta$.

(d) Find expressions for $E(\sqrt{Y})$, $E\left(\frac{1}{Y}\right)$, $E\left(\frac{1}{\sqrt{Y}}\right)$, and $E\left(\frac{1}{Y^2}\right)$. What do you need to assume about α in each case?

#4: $Y \sim \chi^2_\nu$

(a) Give an expression for $E(Y^k)$ if $\nu > -2k$.
(Hint: use #3)

(b) Why do we need $\nu > -2k$?

(c) Find expressions for $E(\sqrt{Y})$, $E\left(\frac{1}{Y}\right)$, $E\left(\frac{1}{\sqrt{Y}}\right)$, and $E\left(\frac{1}{Y^2}\right)$. What do you need to assume about ν in each case?