Let $M_X(t) = E[e^{tX}]$, where $E[X] = \mu$ and $\text{Var}(X) = \sigma^2$.

1. Show $M_X(0) = 1$.

2. Show $M'_X(0) = E[X] = \mu$.

3. Show $M''_X(0) = E[X^2] = \mu^2 + \sigma^2$.

Let $L(t) = \ln(M_X)$, and suppose $E[X] = \mu = 0$ and $\text{Var}(X) = \sigma^2 = 1$.

4. Show $L(0) = 0$.

5. Show $L'(0) = 0$.

6. Show $L''(0) = 1$. 