Extensions of the idea of Moment Generating Functions:

I encourage you to try to find the moment generating function

for Normal random variables (intricate; I will distribute
notes in class about this)

Geometric random variables
$\hookrightarrow$ then Negative Binomial random variables
Exponential random variables (use "t" in the range $t < \lambda$)
$\hookrightarrow$ then Gamma random variables

Note: Say $Y = X_1 + \cdots + X_n$ where the X_j's are independent

$$M_Y(t) = E(e^{tY}) = E(e^{t(X_1 + \cdots + X_n)})$$

$$= E(e^{tX_1} e^{tX_2} \cdots e^{tX_n})$$

by indep of X_j's $\downarrow$

$$= E(e^{tX_1})E(e^{tX_2}) \cdots E(e^{tX_n}) = M_{X_1}(t)M_{X_2}(t) \cdots M_{X_n}(t).$$