STAT/MA 41600
In-Class Problem Set #43: December 7, 2015

1. Suppose that the number of errors a student makes on his exam has a Poisson distribution, with an average of 3. Let X denote the number of errors.
    a. Find the moment generating function $M_X(t)$ of X.
    b. Compute $M_X'(0)$. Hint: You should get 3 for your answer, since $M_X'(0) = \mathbb{E}(X)$.

2. Use X to denote the time (in seconds) that Mary waits for her next text to arrive. Suppose that X has an Exponential distribution, and $\mathbb{E}(X) = 15$.
    a. Find the moment generating function $M_X(t)$ of X.
    b. Compute $M_X'(0)$. Hint: You should get 15 for your answer, since $M_X'(0) = \mathbb{E}(X)$.

3. Same setup as #2.
    a. Compute $M_X''(0)$. This is equal to $\mathbb{E}(X^2)$.
    b. Use your solutions to **2b** and **3a** to compute $\text{Var}(X)$. Does this agree with the formula that you know, for the variance of an Exponential random variable?

4. Suppose that random variable X has probability mass function $P(X = x) = (27/40)(1/3)^x$, for integers $0 \leq x \leq 3$.
    a. Verify that this is a valid probability mass function.
    b. Manually compute the expected value of X.
    c. Find the moment generating function $M_X(t)$ of X. (If you think for a moment, it is possible to write $M_X(t)$ without using any summation signs or addition symbols.)
    d. Compute $M_X'(0)$. Hint: Your answer should agree with your answer for **4b**.