1. **Conditional probability**

   There are two events $A$ and $B$. Suppose $A$ makes $B$ more likely, i.e., the occurrence of event $A$ increases the likeliness of event $B$, does $B$ make $A$ more likely or less likely?

   For instance:
   
   - $A \equiv \{\text{Average temperature in August is }> 80^\circ F\}$
   - $B \equiv \{\text{Yafei’s electricity bill in August is }> \$100\}$.

2. **Baye’s Rule** (Example 1.12 in Green Ross)

   There are two urns. The first one has 2 white and 7 black balls, the second has 5 white and 6 black balls. Flip a fair coin and draw a ball from the first urn or the second urn depending on whether the outcome was a head or tail. Suppose a white ball is selected, what is the probability that the outcome of the toss was a head?
3. Independence
   If \( A \perp B \), then \( A \perp B^c \), \( A^c \perp B \), and \( A^c \perp B^c \).

4. Independence
   A system functions if one of its \( n \) components in parallel works. Component \( i \) works independently with probability \( p_i, i = 1, 2, \ldots, n \). Find the probability that the system functions.
5. **Cumulative distribution functions**

Is $F(x) \equiv e^{-e^{-x}}$, $-\infty < x < \infty$ a CDF?

6. **Expectations**

Let $X$ be a nonnegative random variable, i.e., $X \geq 0$. Show that:

(a) $E[X] = \int_0^\infty P(X > x)dx = \int_0^\infty \bar{F}(x)dx$. 
(b) $\mathbb{E}[X^n] = \int_0^\infty n x^{n-1} \mathbb{P}(X > x) dx$. 