1. Prove DeMorgan's laws. That is, that $(A \cup B)^c = A^c \cap B^c$ and $(A \cap B)^c = A^c \cup B^c$.

2. Prove that $(A^c)^c = A$.

3. Prove that $(A \cup B) \cap C = (A \cap C) \cup (B \cap C)$.

4. Show that the function $\frac{1}{\beta} \exp(-x/\beta)$ integrates to 1 over $x > 0$ for $\beta > 0$.

5. Show that the function $\frac{e^{-x}}{(1+e^{-x})^2}$ integrates to 1 over $-\infty < x < \infty$.

6. Show that the derivative of the function $(1+e^{-x})^{-1}$ is the function from the previous problem.

7. Argue that $\sum_{x=0}^{\infty} e^{-\lambda} \lambda^2 / x! = 1$ for $\lambda > 0$.

8. Plot the functions from the previous 3 problems in R.