Math 141 Key Topics: 7.1-7.3

Section 7.1

- An **experiment** is an activity with observable results. The results are called **outcomes**.
- The **sample space** is the set of all possible outcomes of an experiment.
- A **sample point** is a specific outcome of an experiment.
- An **event** is a *subset* of the sample space.
- We can take unions, intersections, and complements of events, just like with sets.
- S is called the **certain event**, and the empty set, $\emptyset$, is the **impossible event**.
- Two events E and F are **mutually exclusive** if $E \cap F = \emptyset$. They cannot occur at the same time. (With sets, we used the word "disjoint".)

Section 7.2

- The **probability** of an event is a measure of how likely the event is to occur. Probabilities are always between 0 and 1. The closer to 1, the more likely the event is to occur.
- **Simple events** are those events which consist of a single sample point. All simple events are mutually exclusive, since no two single outcomes can occur at the same time.
- The **probability distribution** is a table which gives the probability of each simple event in an experiment. The sum of all probabilities in a distribution must be 1.
- A **uniform sample space** is a sample space in which all outcomes are equally likely. In a uniform sample space, where n is the number of sample points:

$$P(s_1) = P(s_2) = \cdots = P(s_n) = \frac{1}{n}$$

- **Empirical probabilities** are based on data collected, what is actually observed.

$$P(s_i) = \frac{\text{Number of trials in which } s_i \text{ occurs}}{\text{Total number of trials}}$$

- To find the probability of an event E where $E = \{s_1, s_2, \ldots, s_k\}$, just add the probabilities of each simple event in E:

$$P(E) = P(s_1) + P(s_2) + \cdot + P(s_k)$$

- $P(S) = 1$ (where S is the whole sample space) and $P(\emptyset) = 0$.

Section 7.3

- $P(E) \geq 0$ for any event E.

- $P(S) = 1$
- If E and F are mutually exclusive events:

$$P(E \cup F) = P(E) + P(F)$$

- In general, though, for any two events E and F:

$$P(E \cup F) = P(E) + P(F) - P(E \cap F)$$

- $P(E^c) = 1 - P(E)$