CHAPTER 3

Exercise 1. Consider the preference relation that describes someone's preferences over left l and right r shoes, where they only care about the number of usable pairs of shoes they consume. Sketch the indifference curves $\sim(1,1)$ and $\sim(2,2)$ on graph that has l on the x-axis and r on the y-axis. Label the set $\succ(2,2)$.

Exercise 2. Consider the preference relation that describes someone's preferences for red apples r and green apples g, where they only care about the total number of apples they have but not the color. Sketch the indifference curves $\sim(1,1)$ and $\sim(2,2)$ on graph that has r on the x-axis and g on the y-axis. Label the set $\succ(2,2)$.

Exercise 3. Write the following preference relations in \textbf{chain notation}.

- $a \succsim b, a \succsim c, b \succsim a, b \succsim c, c \succsim a, c \succsim b, a \succsim a, b \succsim b, c \succsim c$
- $a \succsim b, a \succsim c, b \succsim a, b \succsim c, a \succsim a, b \succsim b, c \succsim c$
- $a \succsim b, a \succsim c, a \succsim d, b \succsim c, b \succsim d, c \succsim b, c \succsim d, a \succsim a, b \succsim b, c \succsim c, d \succsim d$

Exercise 4. Write the strict preference relation $\succ$ induced by each of the following weak preference relations:

- $p \succsim p, q \succsim q, r \succsim r, p \succsim q, q \succsim r, p \succsim r$
- $p \succsim p, q \succsim q, r \succsim r, p \succsim q, q \succsim p, q \succsim r, r \succsim q, p \succsim r, r \succsim p$

Exercise 5. Write the indifference relation $\sim$ induced by each of the following weak preference relations:

(1) $p \succsim p, q \succsim q, r \succsim r, p \succsim q, q \succsim r, p \succsim r$

(2) $p \succsim p, q \succsim q, r \succsim r, p \succsim q, q \succsim p, q \succsim r, r \succsim q, p \succsim r, r \succsim p$

Exercise 6. Consider this preference relation on $\{a, b, c, d\}$: $a \succsim b, a \succsim c, a \succsim d, b \succsim c, b \succsim d, c \succsim b, c \succsim d, a \succsim a, b \succsim b, c \succsim c, d \succsim d$. What is best from each set?

(1) $\{a, b, c, d\}$

(2) $\{b, c, d\}$

(3) $\{c, d\}$

Exercise 7. A hiker's preferences over locations (x_1, x_2) are represented by how close (distance) they get to the summit of a mountain, which is at the point $(5, 5)$. They are indifferent between two points that are the same distance from $(5, 5)$. For example $(4, 5) \sim (5, 4)$ since both are distance 1 from $(5, 5)$. On the other hand, $(4, 5) \succ (4, 4)$ since $(4, 5)$ is 1 mile away while $(4, 4)$ is $\sqrt{(5 - 4)^2 + (5 - 4)^2} = \sqrt{2}$ away. Are these preferences complete? Are they transitive?

Exercise 8. For the hiker's preferences in the last question, sketch the indifference curve that includes the point $(4, 5)$ and the indifference curve that includes the point $(3, 5)$. Shade the set $\succsim (4, 5)$.