Math 150 03 – Calculus I

Homework assignment 1

Due: Wednesday, September 13, 2023

Write your answers on a separate sheet of paper. Write your name at the top of each page you use, and number each page. Remember to number your answers correctly.

1. Consider the following sets.

$$A = \{1, 3, 5, 7, 9\}$$
 $B = \{2, 4, 6, 8\}$ $C = \{1, 2, 3, 7, 8, 9\}$

- (a) Calculate:
 - i. $A \cup B$ (The union of A and B.)
 - ii. $A \cap B$ (The intersection of A and B.)
 - iii. $A \cup B \cup C$
 - iv. $A \cap B \cap C$
 - v. $A \cup (B \cap C)$
 - vi. $(A \cup B) \cap C$

(b) Consider the relation

$$R = \{(x, y) \in B \times A \mid y = x + 1\}$$

- i. Write out all the elements of R.
- ii. Draw arrows from left to right representing the relation R.

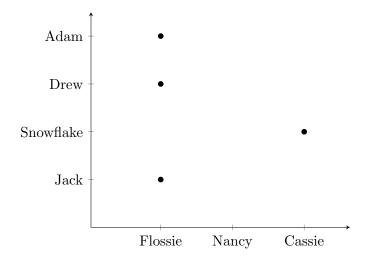
<u>B</u>	<u>A</u>
2	1
4	3
6	5
8	7
	9

- iii. Draw the graph of the relation R.
- iv. Is R a function from B to A? Explain.

2. Let A be the set of Old MacDonald's ewes (female sheep) and let B be the set of Old MacDonald's lambs.

$$A = \{\text{Flossie}, \text{Nancy}, \text{Cassie}\}$$
 $B = \{\text{Jack}, \text{Snowflake}, \text{Drew}, \text{Adam}\}$

Let R be the relation $R = \{(x, y) \in A \times B \mid \text{``x is the mother of } y\text{''}\}$. Here is the graph of R.



- (a) Draw the graph of the relation $Q = \{(x, y) \in B \times A \mid "y \text{ is the mother of } x"\}.$
- (b) Compare the two graphs. What can you say about them?
- (c) Is the relation R a function? What about Q? Explain.
- (d) In general, let M be the set of all mammals of some kind (for instance, let M be the set of all platypuses). Would the relation $\{(x,y) \in M \times M \mid \text{``}x \text{ is the mother of }y\text{''}\}$ be a function from M to M? What about the relation $\{(x,y) \in M \times M \mid \text{``}y \text{ is the mother of }x\text{''}\}$?
- 3. Find the domain and the range of each of the following relations. Which of them are functions? Justify your answers.

