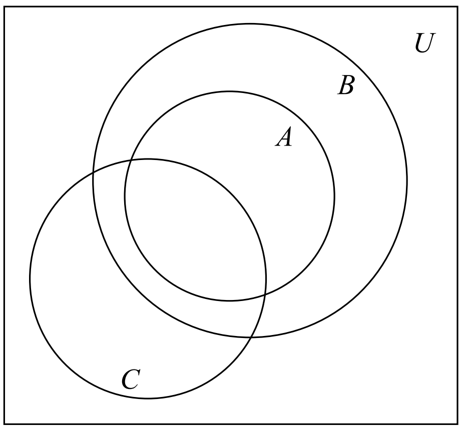
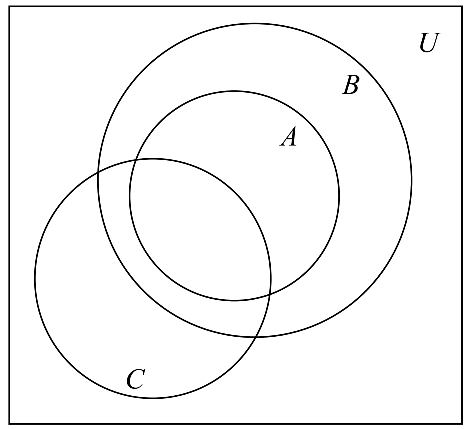
Math 2001-004: Intro to Discrete Math **Exam review activity** Spring 2024

1. Consider the following pair of identical Venn diagrams, each depicting sets A, B, and C, where $A \subseteq B$.





(a) In the diagram on the left, shade in the set $C - B$.

(b) In the diagram on the right, shade in the set $C - A$.

(c) Fill in the blank to complete the following theorem, illustrated by the above Venn diagram:

Theorem. For any sets A, B, and C, we have

$$A \subseteq B \Rightarrow \underline{\hspace{4cm}}.$$

(d) Fill in the blanks to complete the proof of the above theorem.

Proof. Let A, B, and C be ________.

Assume $A \subseteq$ ________. We wish to conclude that ____________________. To do this, assume $x \in$ ____________. Then $x \in C$ and $x \notin B$, by definition of __________________.

Now the assumption $A \subseteq B$ is equivalent to the statement $x \in A \Rightarrow$ ____________, which is equivalent to the contrapositive statement ____________________. So, since $A \subseteq B$ and $x \notin B$, we conclude that ___________. Therefore, since $x \in C$ as already noted, we have $x \in$ ____________, by definition of __________________.

We have shown that, if $A \subseteq B$, then $x \in C - B \Rightarrow$ _______________. In other words,

$$A \subseteq B \Rightarrow \underline{\hspace{4cm}},$$

and we're done. ________________

(In the last blank above, supply an end-of-proof tagline devised by your group.)

2. Given sets A, B, and C, is it always true that

$$(C \cup B) - A = C \cup (B - A)?$$

If so, prove it. If not, give a counterexample.