# Homework

1. Write definitions using elementhood tests for the following sets:
2. {5, 10, 15, 20, 25, 30, …}
3. {-4, -3, -2, -1, 0, 1, 2, 3}
4. {2, 3, 5, 7, 11, 13, 17, 19, 23, …}
5. Use Venn diagrams to verify the following identities. Show how you constructed Venn diagrams for each side of each equation.
   1. (A ∩ B) \ C = (A \ C) ∩ (B \ C)
   2. C ∪ (A \ B) = ((A ∪ C) \ B) ∪ (B ∩ C)
6. Make Venn diagrams for A ∪ C and C ∪ (A \ B).
   1. What can you conclude about whether one of these sets is necessarily a subset of the other?
   2. Give an example of sets A, B, and C for which A ∪ C ≠ C ∪ (A \ B).

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1. Analyze the logical form of the following statement. Let W represent “it is Wednesday,” let S represent “I will go shopping,” and let M represent “I will go to a movie.”
   1. If it is Wednesday, then {I will go shopping and I will not go to a movie}.

Now analyze the following statements. Also, for each statement, determine whether the statement is equivalent to either statement a or its converse.

* 1. I will go shopping only if {it is Wednesday and I will not go to a movie}.
  2. {I will go shopping and not go to a movie} is a sufficient condition for it to be Wednesday.
  3. {I will go shopping and not go to a movie} is a necessary condition for it to be Wednesday.

1. Show the following equivalence using both truth tables and the laws of logic. In your laws of logic solution, justify each of your steps by stating which law you are using.

P ↔ Q is equivalent to ¬P ↔ ¬Q.

1. Find a formula involving only the connectives ¬ and → that is equivalent to each statement below. Explain the reasoning that you used to find your solution.
   1. P ∨ Q.
   2. P ∧ Q.