CS 225 Assignment 3 - Part 2
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Exercise sets for 6.1

12) (a - j)

a) = { x ∈ R | -3 <= x < 2 }

b) = { x ∈ R | -1 < x <= 0 }

c) = { x ∈ R | x < -3 or x > 0 }

d) = { x ∈ R | -3 <= x <= 0 or 6 < x <= 8 }

e) = ∅

f) = { x ∈ R | x <= -1 or x >= 2 }

g) = { x ∈ R | x < -3 or x >= 2 }

h) = { x ∈ R | x <= -1 or x > 0 }

i) = { x ∈ R | x <= -1 or x > 0 }

j) = { x ∈ R | x < -3 or x >= 2 }

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16) (a - c)

a)
A ∪ (B ∩ C) = {a, b, c}
(A ∪ B) ∩ C = {b, c}
(A ∪ B) ∩ (A ∪ C) = (a, b,c, d) ∩ {a, b, c, e } = {a, b, c}

A ∪ (B ∩ C) = (A ∩ B) ∪ (A ∩ C)

b)
A ∩ (B ∪ C) = {a, b, c} ∩ {b, c, d, e} = {b, c}
(A ∩ B) ∪ C = {b, c} ∪ (b, c, e)
(A ∩ B) ∪ (A ∩ C) = {b, c} ∪ {b, c} = {b, c}

A ∩ (B ∪ C) = (A ∩ B) ∪ (A ∩ C)

c)
(A - B) - C = {a} - {b,c,e} = {a}
A - (B - C) = {a, b, c} - {d} = {a, b, c}

Sets are not equal.

Exercises for 6.2

4) (a-i)

a) A ∪ B ⊆ B

b) A ∪ B

c) x ∈ B

d) A

e) or

f) B

g) A

h) B

i) B

10)

- Is (A - B) ∩ (C - B) ⊆ (A ∩ C) - B…

Assume x ∈ (A - B) ∩ (C - B)
// Intersection
x ∈ A - B and x ∈ C - B
// Difference
x ∈ A and x ∉ B and x ∈ C and x ∉ B

// Intersection Again
x ∈ A ∩ C and x ∉ B
// Difference Again
x ∈ (A ∩ C) - B

(A - B) ∩ (C - B) ⊆ (A ∩ C) - B …. is a valid subset.

- Assume x ∈ (A ∩ C) - B
can be written as:
x ∈ A and x ∉ B and x ∈ C and x ∉ B

So definition and difference kick in which ends up with:
x ∈ A - B and x ∈ C - B.

By definition of intersection, x ∈ (A - B) ∩ (C - B).

So by definition of subset… (A ∩ C) - B ⊆ (A - B) ∩ (C - B).

14)
A, B, and C are sets and A ⊆ B.
x ∈ A ∪ C

// Definition of union
x ∈ A or x ∈ C.

In case x ∈ A then since A ⊆ B we have:
x ∈ B so it's true that
x ∈ B or x ∈ C and so by union,
x ∈ B ∪ C.

In case x ∈ C then it is true that x ∈ B or x ∈ C, so by definition of union x ∈ B ∪ C.

Therefore… x ∈ B ∪ C

So by definition of subset
A ∪ C ⊆ B ∪ C

Exercises for section 6.3

12)
Let a ∈ A ∩ (B - C)
=> a ∈ A, a ∈ B - C
=> a ∈ A, a ∈ B, a ∉ C
=> a ∈ A ∩ B, a ∉ (A ∩ C).
The left-hand-side(LHS) is a subset of the right-hand-side (RHS).

Converse:
Let a ∈ (A ∩ B) - (A ∩ C)
=> a ∈ A ∩ B, a ∉ A ∩ C
=> a ∈ A, a ∈ B, a ∉ C
=> a ∈ A, a ∈ B - C.
The RHS is a subset of the LHS.

37)
Let A and B be sets A, B ⊆ U.
$(B^C \cup (B^C - A))^C = (B^C \cup (B^C \cap A))^C$
$= (B^C)^C \cap (B^C \cap A^C)^C$ //De Morgan's Law
$= B \cap (B^C \cap A^C)^C$ //Double Complement Law
$= B \cap ((B^C)^C \cup (A^C)^C)$ //De Morgan's Law
$= B \cap (B \cup A)$ //Double complement Law
$= B$ //Absorption Law

42)
Let A ∩ B sets, A, B ⊆ U. // Set Difference Law
(A - A ∩ B)) ∩ (B - (A ∩ B))