# Q1

## Q1.1

Or expand to:

## Q1.2

Or expand to:

## Q1.3

Or expand to:

## Q1.4

Or expand to:

# Q2.

We bring in new variables:

* Let
* Let
* Let
* Let

Now, we apply them:

* Apply
* Apply
* Apply
* Apply

Thus, the CNF is:

# Q3.

Transform:

SAT Solver

* If p is True: then formula is always True
* If p is Not True: then formula is True when q is True and r is True

Thus, the formula is ***SATISFIABLE***

Transform:

SAT Solver

* If p is True and r is False, then formula is True

Thus, the formula is ***SATISFIABLE***

Transform:

SAT Solver

* If p is False, then formula is True

Thus, the formula is ***SATISFIABLE***

# Q4.

The formula can be broken down into these parts:

Then the graph is:

图表, 折线图

描述已自动生成

# Q5.

* Step 1: Initialization

Initially, each term is in its own equivalence class:

* Step 2: Apply

By the equality , merge .

We get the following equivalence classes:

* Step 3: Apply

By the equality , merge .

We get the following equivalence classes:

* Step 4: Apply

By the equality , merge with.

We get the following equivalence classes:

* Step 5: Analyze

At this stage:

is in (from Step 2).

x is in (from Step 4).

By propagating equivalences:

, so connects to .

, so equivalence forces into the same class as .

This violates the inequality .

* Thus, this formula is ***UNSATISFIABLE***.