Show that p∧(q∨r)≡(p∧q)∨(p∧r): [0=false,1=true]

For p∧(q∨r):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **P** | **Q** | **R** | **Q∨R** | **P∧(Q∨R)** |
| 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 | 0 |
| 0 | 1 | 0 | 1 | 0 |
| 0 | 1 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 1 | 0 | 1 | 1 |
| **1** | **1** | **1** | **1** | **1** |

For (p∧q)∨(p∧r):

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **P** | **Q** | **R** | **P∧Q** | **P∧R** | **(P∧Q)∨(P∧R)** |
| 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 0 | 0 | 0 |
| 0 | 1 | 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 0 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 | 1 | 1 |
| 1 | 1 | 0 | 1 | 0 | 1 |
| **1** | **1** | **1** | **1** | **1** | **1** |

Since last coumn of both truth table(model) is the same we can say that p∧(q∨r)≡(p∧q)∨(p∧r).

¬p∨q

|  |  |  |  |
| --- | --- | --- | --- |
| **p** | **q** | **¬p** | **¬p∨q** |
| t | t | f | t |
| t | f | f | f |
| f | t | t | t |
| **f** | **f** | **t** | **t** |

This is logically equivalent to p→q.

Q: find truth table for p->(q<->r)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **p** | **q** | **r** | **q<->r** | **p→(q<->r)** |
| t | t | t | t | t |
| t | t | f | f | f |
| t | f | t | f | f |
| t | f | f | t | t |
| f | t | t | t | t |
| f | t | f | f | t |
| f | f | t | f | t |
| **f** | **f** | **f** | **t** | **t** |