* 1. 1

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| P | Q | ¬ P | ¬ Q | ¬ (P ∧ Q) | ¬ (P ∨ Q) | (¬ P) ∨ (¬ Q) | (¬ P) ∧ (¬ Q) |
| F | F | W | W | W | W | W | W |
| F | W | W | F | W | F | W | F |
| W | F | F | W | W | F | W | F |
| W | W | F | F | F | F | F | F |

d.h.:

¬ (P ∧ Q) ⇔ (¬ P) ∨ (¬ Q)

¬ (P ∨ Q) ⇔ (¬ P) ∧ (¬ Q)

1.1. 2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| P | Q | ¬ P | P ∧ Q | Q ⇒ P | (P ∧ (Q ⇒ P)) | ((P ∧ Q) ∨ (¬ P)) |
| F | F | W | F | W | F | W |
| F | W | W | F | F | F | W |
| W | F | F | F | W | W | F |
| W | W | F | W | W | W | W |

d.h.:

(P ∧ (Q ⇒ P)) ≠ ((P ∧ Q) ∨ (¬ P))

„Die Aussagen sind nicht gleichbedeutend.“

1.2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| P | Q | ¬ P | ¬ Q | P ∧ Q | ¬ (P ∧ Q) |
| F | F | W | W | F | W |
| F | W | W | F | F | W |
| W | F | F | W | F | W |
| W | W | F | F | W | F |
|  |  |  |  |  |  |
| P ⇒ Q | P ∨ Q | P ⊕ Q | ¬ (P∧¬(Q)) | ¬(¬(P)∧¬(Q)) | ¬ (¬ (P∧¬(Q)) ∧ ¬(Q∧¬(P))) |
| W | F | F | W | F | F |
| W | W | W | W | W | W |
| F | W | W | F | W | W |
| W | W | F | W | W | F |

d.h.:

P ∨ Q ⇔ ¬(¬(P)∧¬(Q)), siehe Wahrheitstabelle (W.2)

P ⊕ Q ⇔ ¬ (¬ (P∧¬(Q)) ∧ ¬(Q∧¬(P))), siehe Wahrheitstabelle (W.2)

P ⇒ Q ⇔ ¬ (P∧¬(Q)), siehe Wahrheitstabelle (W.2)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| P ⇒ Q | Q ⇒ P | ¬ (P∧¬(Q)) | ¬(Q∧¬(P))) | **¬ (¬ (P∧¬(Q)) ∧ ¬(Q∧¬(P)))** |
| W | W | W | W | F |
| W | F | W | F | W |
| F | W | F | W | W |
| W | W | W | W | F |

Begründung von P ⊕ Q ⇔ ¬ (¬ (P∧¬(Q)) ∧ ¬(Q∧¬(P)))

1.3

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| P | Q | ¬P | P∧Q | P\*P | Q\*Q | P\*Q | (P\*P) \* (Q\*Q) |
| F | F | W | F | W | W | W | F |
| F | W | W | F | W | F | F | F |
| W | F | F | F | F | W | F | F |
| W | W | F | W | F | F | F | W |

Der Operator „\*“ ist so zu verstehen:

W = 1, F = 0

0\*0 = 1, 1\*0 = 0

1\*1 = 0, 0\*1 = 0