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**TUGAS 1**

**Proof that these below statement is Tautology**

1. p → (p ∨ q)

¬p ∨ (p ∨ q) {p is always true}

|  |  |  |  |
| --- | --- | --- | --- |
| p | q | p ∨ q | ¬p ∨ (p ∨ q) |
| 1 | 1 | 1 | 1 |
| 1 | 0 | 1 | 1 |
| 0 | 1 | 1 | 1 |
| 0 | 0 | 0 | 1 |

1. ¬p → (*p* →q)

¬p → (¬*p* ∨q)

p ∨ (¬*p* ∨q) {p is always true}

|  |  |  |  |
| --- | --- | --- | --- |
| p | q | ¬*p* ∨q | p ∨ (¬*p* ∨q) |
| 1 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 |
| 0 | 1 | 1 | 1 |
| 0 | 0 | 1 | 1 |

**Proof that these below statements are Equivalent**

1. (*p* →q) ∧ (*p* → *r*) ≡ *p*→(*q* ∧ r)

(¬*p* ∨q) ∧ (¬*p* ∨r) ≡ ¬*p* ∨ (*q* ∧ r)

¬*p* ∨ (*q* ∧ r) ≡ ¬*p* ∨ (*q* ∧ r) {Equivalent on both side}

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| p | q | r | *q* ∧ r | ¬*p* ∨ (*q* ∧ r) |
| 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 | 0 |
| 1 | 0 | 0 | 0 | 0 |
| 0 | 1 | 1 | 1 | 1 |
| 0 | 1 | 0 | 0 | 1 |
| 0 | 0 | 1 | 0 | 1 |
| 0 | 0 | 0 | 0 | 1 |

1. (*p* → *r*) ∨ (*q* → *r*) ≡ (*p* ∧ q) → r

(¬*p* ∨r) ∨ (¬*q* ∨r) ≡ ¬ (*p* ∧ q) ∨ r

(¬*p* ∨ ¬*q*) ∨ r ≡ (¬*p* ∨ ¬*q*) ∨ r {Equivalent on both side}

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| p | q | r | ¬*p* ∨ ¬*q* | (¬*p* ∨ ¬*q*) ∨ r |
| 1 | 1 | 1 | 0 | 1 |
| 1 | 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 | 1 |
| 0 | 1 | 1 | 1 | 1 |
| 0 | 1 | 0 | 1 | 1 |
| 0 | 0 | 1 | 1 | 1 |
| 0 | 0 | 0 | 1 | 1 |