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1. For the following construct a Boolean function equal to the function S defined by the given truth table. Make your function as simple as you can.

|  |  |  |  |
| --- | --- | --- | --- |
| P | Q | R | S = f(P, Q, R) |
| T | T | T | T |
| T | T | F | T |
| T | F | T | T |
| T | F | F | F |
| F | T | T | F |
| F | T | F | T |
| F | F | T | F |
| F | F | F | F |

(p ˄ q ˄ r) ˅ (p ˄ q ˄ ¬ r) ˅ (p ˄ ¬q ˄ r) ˅ (¬p ˄ q ˄ ¬r)

redundancy law:

(p ˄ q) ˅ (p ˄ ¬q ˄ r) ˅ (¬p ˄ q ˄ ¬r)

1. Create the truth table for the following statement:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| p | q | r | ¬p | ¬p ˄ q | ¬ (¬p ˄ q) | ¬ (¬p ˄ q)→r |
| T | T | T | F | F | T | T |
| T | T | F | F | F | T | F |
| T | F | T | F | F | T | T |
| T | F | F | F | F | T | F |
| F | T | T | T | T | F | T |
| F | T | F | T | T | F | T |
| F | F | T | T | F | T | T |
| F | F | F | T | F | T | F |
|  |  |  |  |  |  |  |

1. Prove (or disprove) the following:

is logically equivalent to

|  |  |  |
| --- | --- | --- |
| x | y | x∧y |
| T | T | T |
| T | F | F |
| F | T | F |
| F | F | F |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| x | y | not y | x→(¬y) | ¬(x→(¬y)) |
| T | T | F | F | T |
| T | F | T | T | F |
| F | T | F | T | F |
| F | F | T | T | F |

Both truth tables for ¬(x→(¬y)), and x∧y result in the sequence T, F, F, and F.

Therefore ¬(x→(¬y)), and x∧y are logically equivalent.