Question

B. Determine whether each statement is true or false.

1. $(-1)^{47} = -1$ or $(-1)^{-102} = 1$.
2. 3^{356} is odd and 7^{143} is even.
3. If n is a prime number, then n^3 is a prime number.
4. The lower the standard deviation is better or the higher the relative score is better.
5. If $x < 1$ then one over x is greater than one.
6. $x - 5 \geq 7$ if and only if $x \geq 15$.

C. Determine if the following pair of statements are equivalent.

1. $q \wedge (r \vee q),\ q$
2. $p \vee (\sim r \wedge p), \sim p$
3. $\sim q \rightarrow p,\ p \vee q$
4. $\sim p \rightarrow (p \vee r),\ r$

D. Use conjunction and disjunction to determine an equivalent form of the following statements.

1. $[\sim(p \rightarrow \sim r) \wedge \sim q] \rightarrow r$
2. $[p \wedge (r \rightarrow \sim q)] \rightarrow (r \vee q)$

E. Determine the negations of the following statements.

1. $4 = 7$ if and only if $5 = 3$.
2. $p \rightarrow (q \vee \sim p)$
3. I'll study for the last evaluation or I'll watch a movie.
4. If $2x + 3 = 15$, then $x = 6$.

F. Write the inverse, converse, and contrapositive of the following statements.

1. If $\frac{2n-5}{2}$ is even, then $\frac{2n+5}{2}$ is odd.
2. If I could sing well, then I could be rich.

G. Construct a network diagram for $\{[\sim p \wedge q \wedge r] \vee [(p \wedge q) \wedge \sim r]\} \vee [p \wedge (q \wedge r)]$.

If p is zero and r is one, is the network closed?

H. Determine the outputs for the following gates given the inputs

input (1) = 110101 and input (2) = 000111.

1. NAND
2. XOR
3. XNOR
4. NOR

I. Determine the validity of the following arguments.

1. $p \wedge \sim q$
   $p \leftrightarrow r$
   $\therefore q \vee r$

2. $p \rightarrow \sim q$
   p
   $\therefore \sim q$

J. Use all the premises to determine a valid conclusion for the given argument.

$\sim s \rightarrow q$
$\sim t \rightarrow \sim q$
$\sim t$
$\therefore$

please help me answer all of this. thank you in advance

Solution

No.

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(B) Determine whether each statement is True or false

(1) $(-1)^{47} = -1$ or $(-1)^{-102} = 1$

$\therefore (-1)^{odd} = -1$ and $(-1)^{even} = 1$

and $(-1)^m = \frac{1}{(-1)^{-m}}$

Therefore, $(-1)^{47} = -1$, 47 is odd.

and $(-1)^{-102} = \frac{1}{(-1)^{102}} = \frac{1}{(-1)^{102}}$

$= \frac{1}{1} = 1$

Hence (1) is True.

(2) 3^{356} is odd and 7^{143}

$\therefore$ since unit digit of 3^{4n} is 1.

and $3^{356} = 3^{4\times 89} = 3^{4n}$

$\Rightarrow$ unit digit of $3^{356} = 1$

$\Rightarrow 3^{356}$ is odd.

and

unit digit of 7^{4n+3} is 3

here $7^{143} = 7^{4\times 35+3} = 7^{4n+3}$

So unit digit of 7^{143} is 3

$\Rightarrow 7^{143}$ is odd.

$\Rightarrow$ Statement (2) is True.

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(3) Statement: if n is a prime number, then n^3 is a prime number.

This is false statement.

Take $n = 2$ which is prime
but $n^3 = 2^3 = 8$ which is Not a prime Number.

A different way to see this statement:-

Since n is prime
and n^3 is divisible by n, n^2.

so n^3 has more than 2 factors

$\Rightarrow n^3$ is Not a prime.

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(5) let $n < 1$ they one over n is greater than one.

This is True Statement.

since if $a > b$

$\Rightarrow \frac{1}{a} < \frac{1}{b}$ $\quad a, b \in R$.

Do if

$$x < 1$$

$$\Rightarrow \frac{1}{x} > 1$$

$\Rightarrow$ one over x is greater than one.

(6) $x - 5 \geq 7$ if and only if $x \geq 15$

This is false statement.

let $x = 13$ which Not hold $x \geq 15$

Now,

$$x - 5 = 13 - 5 = 8 \geq 7$$

$$\Rightarrow x - 5 \geq 7.$$

So given statement is false

since condition is if and only if.