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① DSGT

(15) $f(x) = 5x + 4$, $g(x) = x - 3$, find $f(g(6))$

$f(g(6)) = f(g(x))$

$f(x-3)$

$5(x-3) + 4$

$5x - 15 + 4$

$5x - 11$

for value of $x = 6$

$\therefore 5 \times 6 - 11$

$30 - 11$

$= 19$

(14) Inverse of $5x-4$

$f(x) = 5x-4$

$y = 5x-4$

$y = \frac{x+4}{5}$

Replace y by $f^{-1}(x)$

$\therefore f^{-1}(x) = \frac{x}{5} + \frac{4}{5}$

$\therefore$ Inverse of $5x-4 = \frac{x}{5} + \frac{4}{5}$

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(8) $P(n) = 1+5+9+ \dots + (4n-3) = n(2n-1)$

$P(1) = 1 : 1(2\times1-1)$, which is true

Hence $P(1)$ is true.

let's assume $P(n)$ is true for $n=K$

$\therefore$ $P(K) : 1+5+9 \dots + (4k-3) = k(2k-1)$ — (1)

now to prove for $P(k+1)$ is true

$P(k+1) : 1+5+9 \dots + (4k-3)\ (4(k+1)-3))$

$= 2k^2 - k + 4k + 4-3$

$= 2k^2 + 3K + 1$

$(k+1)(2k+1)$

$= (k+1)(2(k+1)-1)$

Hence it's true for $P(k+1)$ wherever $P(k)$ is true

(12). $A = \{1,2,3,4\}$

$R = \{(1,1)\ (1,2)\ (2,1)\ (2,2)\ (3,1)\ (3,3)\ (1,3)\ (4,1)\ (4,4)\}$

Equivalence
For ~~Transitive~~ checking

Reflexive, Symmetric and Transitive

$\therefore$ ~~It's reflexive as (1,1) (2,2) (3,3) (4,4)~~

It's symmetric as $(1,1)\ (1,2) \longrightarrow (2,1)$

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(13). Construct the truth Tables for the following.

i) $(\sim p \vee q) \rightarrow q$

p	q	$\sim p$	$\sim p \vee q$	$(\sim p \vee q) \rightarrow q$
T	T	F	T	T
T	F	F	F	T
F	T	T	T	T
F	F	T	T	F

ii) $\sim(p \vee q) \vee (p \leftrightarrow q)$

p	q	$p \vee q$	$\sim p \vee q$	$p \leftrightarrow q$	$\sim(p \vee q) \vee (p \leftrightarrow q)$
T	T	T	F	T	T
T	F	T	F	F	F
F	T	T	F	F	F
F	F	F	T	T	T

(iii) $(\sim p \to r) \land (p \leftrightarrow q)$

p	q	r	$\sim p$	$\sim p \to r$	$p \leftrightarrow q$	Ans.
T	T	T	F	T	T	T
T	T	F	F	T	F	F
T	F	T	F	T	T	T
T	F	F	F	T	F	F
F	T	T	T	T	F	F
F	T	F	T	T	T	T
F	F	T	T	F	F	F
F	F	F	T	F	T	F

(iv) $((\overset{A}{\sim p \land q}) \lor (\overset{B}{q \land r})) \to r$

p	q	r	$\sim p$	$\sim p \lor q$	$q \land r$	$A \lor B$	$\sim p \land q \lor q \land r \to r$
T	T	T	F	F	T	T	T
T	T	F	F	F	F	F	T
T	F	T	F	F	F	F	T
T	F	F	F	F	F	F	T
F	T	T	T	T	T	T	T
F	T	F	T	T	F	T	F
F	F	T	T	F	F	F	T
F	F	F	T	F	F	F	T

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(10) consider a set $A = \{\{1,2,3\},\{4,5\},\{6,7,8\}\}$

(1). what are the elements of A.

$$A = \{1,2,3,4,5,6,7,8\}$$

(2). Determine whether each of the following is True or False

i) $1 \in A$:- False

ii) $\{1,2,3\} \subset A$:- False

iii) $\{6,7,8) \in A$:- True

iv) $\{\{4,5\}\} \subset A$:- True

v) $\phi \in A$:- False

vi) $\phi \subset A$:- True

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(5) Prove that $p \wedge (q \vee r)$ and $(p \wedge q) \vee (p \wedge r)$ are logical equival

p	q	r	$q \vee r$	$p \wedge (q \vee r)$	$p \wedge q$	$p \wedge r$	$(p \wedge q) \vee (p \wedge r)$
T	T	T	T	T	T	T	T
T	T	F	T	T	T	T	T
T	F	T	T	T	F	T	T
T	F	F	F	F	F	F	F
F	T	T	T	F	F	F	F
F	T	F	T	F	F	F	F
F	F	T	T	F	F	F	F
F	F	F	F	F	F	F	F

(6) let

p : Rajan is rich

q : Rajan is happy

(i) Rajan is Poor but Happy :- $\sim P(x) \wedge \sim Q(x)$

(ii) Neither Rich nor Happy :- $\sim P(x) \vee \sim Q(x)$

(iii) either Rich or unhappy :- $p \vee \sim q$

(iv) Poor or else rich and unhappy :- $(\sim p) \vee (p \wedge \sim q)$

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(4) $R \to R$ is defined by $f(x) = x^3$, $g: R \to R$ is defined by $g(x) = 4x^2+1$ and $h: R \to R$ is defined by $h(x) = 7x-2$.

(i) gof $\quad g(x) = 4x^2+1 \quad f(x) = x^3$.

$$g[f(x)] = g[x^3] = g[x^3]$$

$$gof = [(4x^2+1)^3]$$

(ii) $fogoh = fog[h(x)] = fog[7x-2]$

$$fo[7(4x^2+1)-2]$$

$$fo[28x^2+7-2] = fo[28x^2+5]$$

$$[28(x^3)^2+5]$$

$$fogoh = 28x^6+5$$

(iii) $goh = g[h(x)] = g[7x-2] = 7(4x^2+1)-2$

$$= 28x^2+1-2$$

$$= 28x^2-1$$

(iv) $hogof = hog[f(x)] = hog[x^3] = ho[(4x^2+1)^3]$

$$ho[(4x^2+1)^3] = (4(7x-2)^2+1)^3$$

(v) $gohof = goh[f(x)] = goh[x^3] = go[(7x-2)^2]$

$$(7(4x^2+1)-2)^2 = 28x^2+7-2$$

$$= (28x^2+5)^2$$