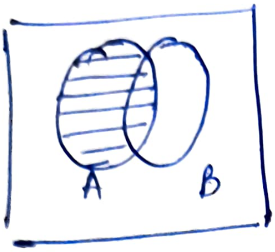
Answer key (Test 01)

1. c)
2. b)
3 c)
4 b)
5) d)
6) c)
7) a)
8) d)
9) d)
10) d)

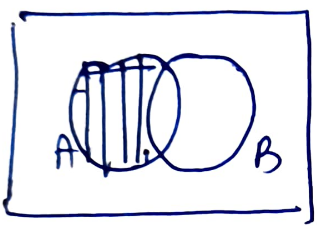
Section B

11. Venn diag

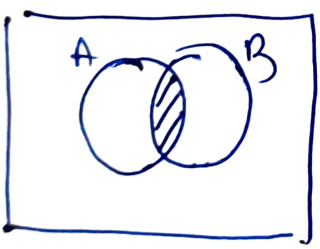
LHS



A

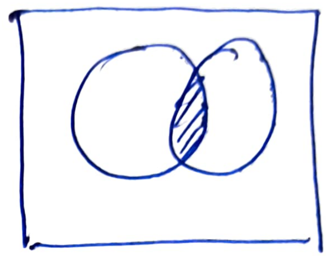


A − B



A − (A − B)

RHS



12. LHS

$(A \cap B) \cup (A - B)$

$(A \cap B) \cup (A \cap B')$ $(\because A - B = A \cap B')$

$A \cap (B \cup B')$ (Dist law)

$A \cap U$ (Universal law)

$A = RHS$ (Identity law

12 (OR)

LHS $A - (A \cap B)$

$= A \cap (A \cap B)'$ $(\because X - Y = X \cap Y')$

$= A \cap (A' \cup B')$. (D morgan's law)

$= (A \cap A') \cup (A \cap B')$ (Dist. law)

$= \phi \cup (A \cap B')$ (Complemetry law)

$= A \cap B'$ (Identy law)

$= A - B$

$= RHS$.

13.

$f(x) = g(x)$

$3x^2 - 1 = 3 + x$

$3x^2 - x - 1 - 3 = 0$

$3x^2 - x - 4 = 0$

$3x^2 - 4x + 3x - 4 = 0$

$x(3x - 4) + 1(3x - 4) = 0$

$(x+1)(3x-4) = 0$

$x = -1, 4/3$

Section C.

14. As $(1,1) \in f$

$\Rightarrow f(1) = 1$

$\Rightarrow a(1) + b = 1$

$\Rightarrow a + b = 1 \quad \text{---} (1)$

$(0,-1) \in f$

$\Rightarrow f(0) = -1$

$\Rightarrow a(0) + b = -1$

$\Rightarrow b = -1$ put in (1)

$a = 2$

$\therefore a = 2, b = -1.$

15. $f(x) = \dfrac{1}{1-x^2}$

Domain: $x \in R - \{1, -1\}$

Range: Let $y = f(x)$

$y = \dfrac{1}{1-x^2}$

$y - yx^2 = 1$

$y - 1 = yx^2$

$x^2 = \dfrac{y-1}{y}$

$$x = \sqrt{\frac{y-1}{y}}$$

$$\frac{y-1}{y} \geq 0$$

$+ \quad - \quad +$

$0 \quad 1$

$y \in (-\infty, 0) \cup [1, \infty)$ (Range)

OR

$$f(x) = \frac{x+1}{x-1}$$

$$f(f(x)) = f\left(\frac{x+1}{x-1}\right)$$

$$= \frac{\left(\frac{x+1}{x-1}\right)+1}{\left(\frac{x+1}{x-1}\right)-1}$$

$$= \frac{x\cancel{+1}+x\cancel{-1}}{\cancel{x}+1\cancel{-x}+1} = \frac{2x}{\cancel{2}} = x.$$

Hence shown.

Section D

16 (a)

$R = \{(x,y) : y^2 = x, x \in P, y \in Q\}$

b) Domain $\{9, 4, 25\}$

c) Range $\{5, 3, 2, 1, -2, -3, -5\}$

or

Co-domain $\{5, 3, 2, 1, -2, -3, -5\}$

17. $n(U) = 400$

$n(A) = 200$ A: Public transport

$n(B) = 180$ B: Bicycle

$n(A \cap B) = 80$

(i) $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

$= 200 + 180 - 80$

$= 300$

(ii) $n(\text{only } A) = n(A) - n(A \cap B)$

$= 200 - 80 = 120$

(iii) $n(\text{only one transport}) = n(\text{only } A) + n(\text{only } B)$

$= 120 + 100$

$= 220$

or $n(A \cup B)' = n(U) - n(A \cup B) = 400 - 300 = 100$

Section-E

Q-18 (a)

$A = \{2, 3, 4\}$

$B = \{3, 5, 6\}$

$C = \{6, 7, 2\}$

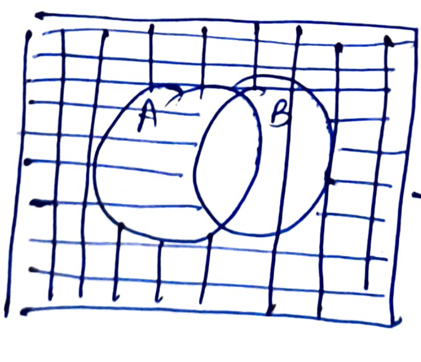
$A \cap B = \{3\}$

$B \cap C = \{6\}$

$A \cap C = \{2\}$

But $A \cap B \cap C = \phi$.

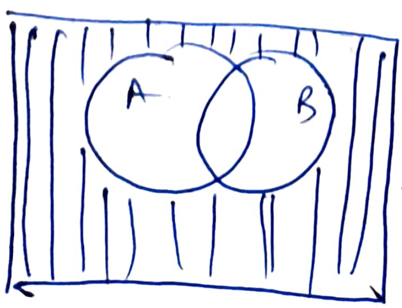
(b) (i) $A' \cap B'$



$A' =$

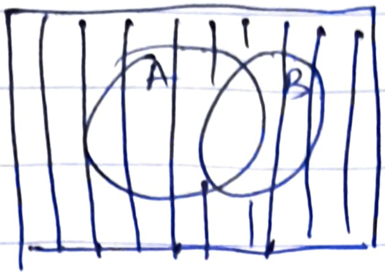
$B' =$

$A' \cap B' =$



$A' \cap B'$

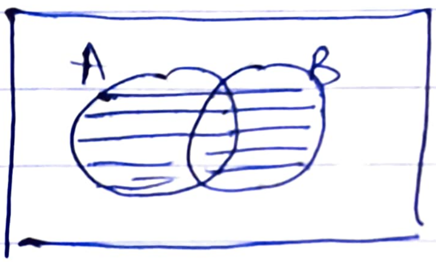
ii



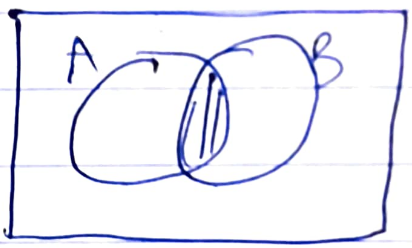
$(A \cap B)' =$ 

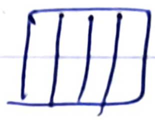
(iii)

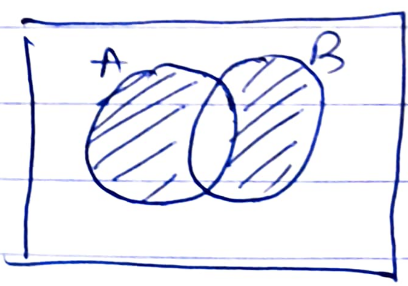
$(A \cup B) - (A \cap B)$

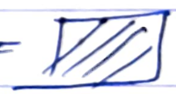


$A \cup B$ 



$A \cap B$ 



$(A \cup B) - (A \cap B) =$ 

OR

L.H.S

$A = A \cup \phi$ (Identity law)

$= A \cup (B \cap X)$ ($\because \phi = B \cap X$ given)

$= (A \cup B) \cap (A \cup X)$ (Dist. law)

$= (A \cup B) \cap (B \cup X)$ ($\because A \cup X = B \cup X$ given)

$= (B \cup A) \cap (B \cup X)$ ($\because A \cup B = B \cup A$)

$= B \cup (A \cap X)$ (Dist. law)

$= B \cup \phi$ ($\because A \cap X = \phi$ given)

$= B$ = RHS (Identity law)

As LHS = RHS Hence prove.

19.

Given: (i) $f(x) = \frac{x^2}{1+x^2}$

Let $y = f(x)$

$$y = \frac{x^2}{1+x^2}$$

$$y + yx^2 = x^2$$

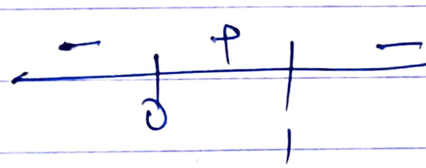
$$y = x^2 - yx^2$$

$$y = x^2(1-y)$$

$$x^2 = \frac{y}{1-y}$$

$$x = \sqrt{\frac{y}{1-y}}$$

$$\frac{y}{1-y} \geq 0$$



$$y \in [0,1)$$

19 (ii)

$$y = \sqrt{9-x^2}, \quad y \geq 0$$

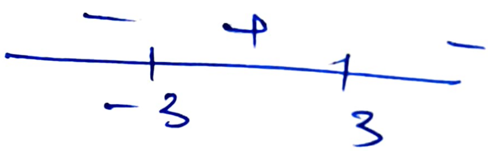
$$y^2 = 9 - x^2$$

$$x^2 = 9 - y^2$$

$$x = \sqrt{9-y^2}$$

$$9 - y^2 \geq 0$$

$$(3-y)(3+y) \geq 0$$



$y \in [-3, 3]$ but $y \geq 0$

$\therefore y \in [0, 3]$