QB365

Model Question Paper 1

12th Standard CBSE

Maths

Reg.No. :

Time : 02:00:00 Hrs

Total Marks : 100

Section-A

1) If f(X)=X+7 and g(X)=X-7, $X \in R$, find fog(7). ? **1**

2) If the binary operation * on the set of integers Z is defined by a*b=a+3b^2 then find the value of 2*4. **1**

3) Let * be a binary operation , on the set of all non-zero real numbers given by a*b=$\frac{ab}{5}$ for all a,b $\in R-\{0\}$ Find the value of x, given that 2*(x*5)=10 **1**

4) Using principal value, evaluate the following: $cos^{-1}\left(cos\frac{2\pi}{3}\right)+sin^{-1}\left(sin\frac{2\pi}{3}\right)$ **1**

5) Solve for X, $tan^{-1}\frac{1-X}{1+X}=\frac{1}{2}tan^{-1}X, \quad X>0.$ **1**

6) Write the principal values of the following: $cos^{-1}\left(cos\frac{7\pi}{6}\right)$ **1**

7) Write the value of x-y+z from the following equation : $\begin{bmatrix} x+y+z \\ x+z \\ y+z \end{bmatrix}=\begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix}$ **1**

8) If A is a square matrix of order 3 and |3A|=k|A|, then write the value of k. **1**

9) If $A=\begin{vmatrix} 3 & 10 \\ 2 & 7 \end{vmatrix}$, then write A^{-1} **1**

10) If A square matrix of order 3 such that |adjA|=225, find |A'|. **1**

Section-B

11) Define Reflexive.Give one example. **2**

12) Write in the simplest form : $tan^{-1}\left[\frac{cos\quad x}{1+sin\quad x}\right], x\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$ **2**

13) If $A=\begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}, B=\begin{bmatrix} -1 & 4 \\ 0 & 2 \end{bmatrix}$, show that $AB \neq BA$. **2**

14) If $A=\begin{bmatrix} 0 & x & -4 \\ -2 & 0 & -1 \\ y & -1 & 0 \end{bmatrix}$ is skew symmetric matrix, find the values of x and y. **2**

15) Prove the following by the principle of mathematical induction : **2**

if $A=\begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$, then $A^n=\begin{bmatrix} 1+2n & -4n \\ n & 1-2n \end{bmatrix}$ for every positive integer n.

16) If $A=\begin{vmatrix} 2 & 3 & -1 \\ 4 & 1 & 0 \\ 3 & 3 & 2 \end{vmatrix}$, find $M_{12}\times M_{21}+C_{21}\times C_{12}$ **2**

when M_{jj} called minor and C_{jj} called co-factors of A.

Section-C

17) Show that the relation R in the set Z of integers given by: **3**

R={(a,b):2divides a-b} is an equivalence relation

18) Let '*' be the binary operation on the set {1,2,3,4,5} defined by: **3**

a*b=H.C.F. of a and b.

Is the operation '*' same as the operation '*' defined in above? Justify your answer.

19) Show that : **3**

$sin^{-1}(2x\sqrt{1-x^2})=2cos^{-1}x, \frac{1}{\sqrt{2}}\leq x\leq 1.$

20) Find the value of $sin^{-1}\left(sin\frac{3\pi}{5}\right)$ **3**

21) Solve the equation for x,y,z and t, if:$2\begin{bmatrix} x & z \\ y & t \end{bmatrix}+3\begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix}=3\begin{bmatrix} 3 & 5 \\ 4 & 6 \end{bmatrix}$. **3**

22) Find the minor of the element '6' in the determinant $\Delta=\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}$. **3**

Section-D

23) Let Z be the set of all integers and R be the relation on Z defined as R={(a,b):a,b $\in$ Z, and (a-b) is divisible by 5}. Prove that R is an equivalence relation. 4

24) Consider the binary operation * on the set {1,2,3,4,5} defined by a*b=min{a,b}. Write the operation table of the operation *. 4

25) A binary operation on the set {0,1,2,3,4,5} is defined as: $a * b = \begin{cases} a+b, & if \quad a+b<6 \\ a+b-6, & if \quad a+b \geq 6 \end{cases}$ Show that zero is the identity for this operation and each element a. of the set is invertible with 6-a, being the inverse of a. 4

26) Let Y={n^2:n $\in$ N} $\subset$ N. Consider f:N $\rightarrow$ Y as f(n)=n^2 Show that f is invertible. Find the inverse of f. 4

27) Let * be a binary operation defined on Q. find which of the binary operations are associative. (i)a*b=a-b (ii)a*b=$\frac{ab}{4}$ (iii)a*b=a-b+ab (iv)a*b=ab^2 4

28) Let $Y=\{n^2, n \in N\} \subset N \quad N \rightarrow Y \quad f(n)=n^2$ Consider $f: N \rightarrow Y$ as $f(n)=n^2$.Show that f is invertible.Also, find the inverse of 4

Section-E

29) Consider $f: R_+ \rightarrow [-5, \infty)$ given by f(x)=9x^2+6x-5 Show that f is invertible find $f^{-1}(x)$ where R_+ is the set of all non-negative real numbers. 6

30) Let A= $R \times R$ and * be a binary operation on A defined by 6

(a,b)*(c,d)=(a+c,b+c)

Show that * is commutative and associative. Find the identity element for * on A. Also find • the inverse of every element (a, b) $\in A$ *.

31) Determine whether the operation * define below on Q is binary operation or not. 6

a*b=ab+1

If yes, check the commutative and the associative properties. Also check the existence of identity element and the inverse of all elements is Q.

32) If $A=\begin{pmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{pmatrix}$, prove that A^3 - 6A^2 + 7A + 2I = 0 6

33) Using properties of determinants, show that triangle ABC is isosceles if: $\begin{vmatrix} 1 & 1 & 1 \\ 1+cosA & 1+cosB & 1+cosC \\ \cos^2A+cosA & \cos^2B+cosB & \cos^2B+cosC \end{vmatrix}=0$ 6

34) If $A^{-1}=\begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{bmatrix} and B=\begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$, find $(AB)^{-1}$. 6

****

Section-A

1) $fog=f(g(7))=f(7-7)=f(0)=0+7=7$ 1

2) 2 * 4 = 2+3$(4)^2$ = 50 1

3) $\Rightarrow 2*(x*5)=10 \Rightarrow 2*\left(\frac{5x}{5}\right)=10 \Rightarrow 2*x=10 \Rightarrow \frac{2x}{5}=10 \Rightarrow x=\frac{50}{2}$ x=25 1

4) π 1

5) $\frac{1}{\sqrt{3}}$. 1

6) $\frac{5\pi}{6}$ 1

7) $x+y+z=9, x+z=5, y+z=7 \Rightarrow z=3, x=2, y=4; x-y+z=2-4+3=1$ 1

8) 27 1

9) $A^1=\begin{vmatrix} 3 & 10 \\ 2 & 7 \end{vmatrix}$ **Alternative Method:** $A=\begin{vmatrix} 3 & 10 \\ 2 & 7 \end{vmatrix} A^1=\frac{1}{|A|}(adjA)|A|=\begin{vmatrix} 3 & 10 \\ 2 & 7 \end{vmatrix}=21-20=1 adjA=\begin{vmatrix} 7 & -10 \\ -2 & 3 \end{vmatrix} \Rightarrow A^1=\begin{vmatrix} 7 & -10 \\ -2 & 3 \end{vmatrix}$ 1

10) $|A'|=\pm 15$ **Alternative Method:** |adjA|=$|A|_{n-1}$, where n is the order of the matrix. $|A|_2=15_{12}$⇒±15⇒|A'|=±15 1

Section-B

11) Reflexive Relation : A relation R on a set A is called reflexive relation if aRa for every $a \in A$; if (a,a) $\in$ R, for every $a \in A$ 2

Example let

A=[1,2,3]

AxA =(1,1) (1,2)(1,3) (2,1) (2,2) (2,3) (3,1)(3,2) (3,3) $\in R$

Since (a,a) $\in R$ for every $a \in A$

12) 2

$$\tan^{-1}\left[\frac{\cos\ \ x}{1+\sin\ \ s}\right] \quad \because \begin{cases} \cos\ \ x = \cos^2\frac{x}{2} - \sin^2\frac{x}{2} \\ and\ \ \ 1+\sin\ \ x = \left(\cos\frac{x}{2}+\sin\frac{x}{2}\right)^2 \end{cases}$$

$$= \tan^{-1}\left[\frac{\cos^2\frac{x}{2}-\sin^2\frac{x}{2}}{\left(\cos\frac{x}{2}+\sin\frac{x}{2}\right)^2}\right]$$

$$= \tan^{-1}\left[\frac{\left(\cos\frac{x}{2}+\sin\frac{x}{2}\right)\left(\cos\frac{x}{2}-\sin\frac{x}{2}\right)}{\left(\cos\frac{x}{2}+\sin\frac{x}{2}\right)^2}\right]$$

$$= \tan^{-1}\left[\frac{\cos\frac{x}{2}-\sin\frac{x}{2}}{\cos\frac{x}{2}+\sin\frac{x}{2}}\right] Divide\ \ by\ \ \cos\frac{x}{2},\ \ we\ \ get$$

$$= \tan^{-1}\left[\frac{1-\tan\frac{x}{2}}{1+\tan\frac{x}{2}}\right]$$

$$= \tan^{-1}\left[\tan\left(\frac{\pi}{4}-\frac{x}{2}\right)\right] = \frac{\pi}{4}-\frac{x}{2}$$

13) We have, $A = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 4 \\ 0 & 2 \end{bmatrix}$ 2

$$AB = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}\begin{bmatrix} -1 & 4 \\ 0 & 2 \end{bmatrix}$$

$$AB = \begin{bmatrix} -2+0 & 8+2 \\ -3+0 & 12+8 \end{bmatrix}$$

$$\begin{bmatrix} -2 & 10 \\ -3 & 20 \end{bmatrix}$$

and $BA = \begin{bmatrix} -1 & 4 \\ 0 & 2 \end{bmatrix}\begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$

$$= \begin{bmatrix} 10 & 15 \\ 6 & 8 \end{bmatrix}$$

$\therefore\ \ AB \neq BA$

14) 2

$$A = \begin{bmatrix} 0 & x & -4 \\ -2 & 0 & -1 \\ y & -1 & 0 \end{bmatrix}$$

$$A' = \begin{bmatrix} 0 & -2 & y \\ x & 3 & -1 \\ -4 & -1 & 0 \end{bmatrix}$$

For skew symmetric

$A = -A'$

$$\Rightarrow \begin{bmatrix} 0 & x & -4 \\ -2 & 0 & -1 \\ y & -1 & 0 \end{bmatrix} = -\begin{bmatrix} 0 & -2 & y \\ x & 3 & -1 \\ -4 & -1 & 0 \end{bmatrix}$$

x = 2, y = 4

15) We shall prove the result by mathematical induction on n. **2**

Step 1 : When n = 1, by the definition or integral powers of a matrix, we have

$$A^1 = \begin{bmatrix} 1+2(1) & -4n \\ n & 1-2(1) \end{bmatrix} = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$$

So, the result is true for n = 1.

Step 2 : Let the result be true for n = m. Then,

$$A^m = \begin{bmatrix} 1+2m & -4m \\ m & 1-2m \end{bmatrix}$$

Now, we will show that the result is true for n = m + 1, i.e.,

$$A^{m+1} = \begin{bmatrix} 1+2(m+1) & -4(m+1) \\ (m+1) & 1-2(m+1) \end{bmatrix}$$

By the definition of integral powers of a square matrix, we have

$A^{m+1} = A^m . A$

$$\Rightarrow \quad A^{m+1} = \begin{bmatrix} 1+2m & -4m \\ m & 1-2m \end{bmatrix}\begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$$

[by supposition (i)]

$$\Rightarrow \quad A^{m+1} = \begin{bmatrix} 3+6m-4m & -4-8m+4m \\ 3m+1-2m & -4m-4+2m \end{bmatrix}$$

$$= \begin{bmatrix} 1+2(m+1) & -4(m+1) \\ (m+1) & 1-2(m+1) \end{bmatrix}$$

This shows that the result is true for n = m + 1, whenever it is true for n = m.

Hence, by the principle of mathematical induction, the result is true for any positive integer n.

16) **2**

We have,

$$A = \begin{vmatrix} 2 & 3 & -1 \\ 4 & 1 & 0 \\ 3 & 3 & 2 \end{vmatrix}$$

$$M_{12}\begin{vmatrix} 4 & 0 \\ 3 & 2 \end{vmatrix} = 8 - 0 = 8M_{21}\begin{vmatrix} 3 & -1 \\ 3 & 2 \end{vmatrix} = 6 + 3 = 9C_{21} = -\begin{vmatrix} 3 & -1 \\ 3 & 2 \end{vmatrix} = -(6+3) = -9C_{12} = -\begin{vmatrix} 4 & 0 \\ 3 & 2 \end{vmatrix} = -(8-0) = -8M_{12} \times M_{21} + C_{21} \times C_{12} 8 \times (9) + (-9)(-8) = 72 + 72 = 1$$

Section-C

17) Here R={(a,b):divides a-b}. **3**

R is reflexive [$\because (a, a) \in R$ as 2 divides a-a=0]

R is symmetric [$\because (a, b) \in R \Rightarrow$ 2 divides a-b $\Rightarrow$ 2 divides b- a $\Rightarrow$ $(b, a) \in R$]

R is transitive [$\because (a, b) \in R$ and $(b, c) \in R$ $\Rightarrow$ 2 divides a-b and 2 divides b-c $\Rightarrow$ 2 divides (a-b)+(b-c) i.e (a-c) $\Rightarrow (a, b) \in R$]

Hence, R is an equivalence relation.

18) We have a*b=H.C.F. of a and b. **3**

The composition table is as below:

*	1	2	3	4	5
1	1	1	1	1	1
2	1	2	1	2	1
3	1	1	3	1	1
4	1	2	1	4	1
5	1	1	1	1	5

19) Let $\cos^{-1} x = \theta$ so that $x = \cos\theta$ **3**

Since $\sin 2\theta = 2 \sin\theta \cos\theta$

$\therefore \quad \sin 2\theta = 2\sqrt{cos^2\theta}\cos\theta \qquad = 2\sqrt{1-x^2}.x \qquad = 2x\sqrt{1-x^2} \Rightarrow \qquad 2\theta = sin^{-1}(2x\sqrt{1-x^2})$

Hence, $2cos^{-1}x = sin^{-1}(2x\sqrt{1-x^2})$

20) $sin^{-1}\left(sin\frac{3\pi}{5}\right) = sin^{-1}\left(sin\left(\pi - \frac{2\pi}{5}\right)\right) = sin^{-1}\left(sin\frac{2\pi}{5}\right). \left[\because \frac{2\pi}{5} \in \left(-\frac{\pi}{2}, \frac{\pi}{2}\right)\right] = \frac{2\pi}{5}$ **3**

21) $We\ have: 2\begin{bmatrix} x & z \\ y & t \end{bmatrix} + 3\begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix} = 3\begin{bmatrix} 3 & 5 \\ 4 & 6 \end{bmatrix} \quad \Rightarrow \quad \begin{bmatrix} 2x & 2z \\ 2y & 2t \end{bmatrix} + \begin{bmatrix} 3 & -3 \\ 0 & 6 \end{bmatrix} = \begin{bmatrix} 9 & 15 \\ 12 & 18 \end{bmatrix} \quad \Rightarrow \quad \begin{bmatrix} 2x+3 & 2z-3 \\ 2y & 2t+6 \end{bmatrix} = \begin{bmatrix} 9 & 15 \\ 12 & 18 \end{bmatrix}.$ **3**

Equating corresponding elements:

2x+3 = 9 $\Rightarrow$ 2x = 9-3 = 6 $\Rightarrow$ x = 3

2y = 12 $\Rightarrow$ y = 6

2z-3 = 15 $\Rightarrow$ 2z = 3+15 = 18 $\Rightarrow$ z = 9

and 2t+6 = 18 $\Rightarrow$ 2t = 18-6 = 12 $\Rightarrow$ t = 6.

Hence, x = 3, y = 6, z = 9 and t = 6.

22) 3

$$\Delta = \begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & [6] \\ 7 & 8 & 9 \end{vmatrix}.$$

Minor of 6= Minor of a_{23}

$$\begin{vmatrix} 1 & 2 \\ 7 & 8 \end{vmatrix} = 8 - 14 = -16.$$

Section-D

23) For $a \in Z, a - a = 0,$ which is divisible by 5. 4

$\therefore (a, a) \in R \forall a \in Z.$

Thus R is reflexive.

Now let $(a, b) \in R$ $\Rightarrow$ a-b is divisible by 5

$\Rightarrow$ b-a is divisible by 5 $\Rightarrow (b, a) \in R.$

Thus R is symmetric.

Again let $(a, b) \in R, \quad (b, c) \in R$

$\Rightarrow$ a-b and b-c are divisible by 5

$\Rightarrow$ (a-b)+(b-c)=a-c is divisible by 5

$\Rightarrow (a, c) \in R.$

Thus R is transitive.

Hence, R is an equivalence relation.

24) Given a * b = min {a,b} 4

Operation table for * is

*	1	2	3	4	5
1	1	1	1	1	1
2	1	2	2	2	2
3	1	2	3	3	3
4	1	2	3	4	4
5	1	2	3	4	5

25) The binary operation "*' on the set {0,1,2,3,4,5} is defined as: 4

$a * b = \{a + b, \quad if \quad a + b < 6a + b - 6, \quad if \quad a + b \geq 6.\}$

Thus we have the operation table:

Operation Table

*	0	1	2	3	4	5
0	0	1	2	3	4	5
1	1	2	3	4	5	0
2	2	3	4	5	0	1
3	3	4	5	0	1	2
4	4	5	0	4	2	3
5	5	0	1	2	3	4

$[\because \quad 0 * 0 = 0, \ldots\ldots., 5 * 5 = 5; 0 * 1 = 1, \ldots\ldots\ldots\ldots\ldots., 5 * 1 = 5 + 1 - 6 = 0; etc.]$

Existence of Identity:

$a * 0 = a = a + 0$ for each $a \in \{0, 1, 2, 3, 4, 5\}$

$[\because \quad 0 + 0 = 0, 1 + 0 = 1, \quad \ldots\ldots.., \quad 5 + 0 = 5]$

Hence, '0' is identity for the given operation.

Existence of Inverse:

If 'b' be the inverse of 'a', then:

a*b=0=b*a.

Now $a * b = 0 \Rightarrow a + b - 6 = 0 \Rightarrow b = 6 - a.$

$\because$ For each element 'a', '6-a' is the inverse of a.

When a=1, then b=6-1=5.

When a=2, then b=6-2=4.

When a=3, then b=6-3=3.

When a= 4, then b=6-4=2.

When a= 5, then b=6-5=1.

Hence, the inverse of 1,2,3,4 and 5 is 5,4,3,2 and 1 respectively

26) Let $y \in Y$, where y is arbirary. 4

Here y is of the form n^2 , for $n \in N$

$\Rightarrow \sqrt[n]{y}$.

This motivates a function:

$g : Y \rightarrow N$, defined by $g(y) = \sqrt{y}$.

Now $gof(n) = g(f(n)) = g(n^2) = \sqrt{n^2} = n$

and $fog(y) = f(g(y)) = f\left(\sqrt{y}\right) = \left(\sqrt{y}\right)^2 = y$.

Thus $gof = I_N$ and $fog = I_Y$.

Hence, f is invertible with $f^{-1} = g$.

27) (i)Not associative (ii)Associative (iii)Not associative (iv)Not associative 4

28) $f^{-1} = g, where \quad g(y) = \sqrt{y}$ 4

Section-E

29) $\forall x \in [0, \infty), y = 9x^2 + 6x - 5$ 6

$= (3x + 1)^2 - 6 \geq -5 \prec$

$f = \quad [-5, \infty)$

Co-domain f,hence f is not onto and hence not invertible

Let us take the modified co-domain

$f = \quad [-5, \infty)$

Let us now check whether f is one-one

Let $x_1, x_2 \neq [0, \infty) f(x_1) = f(x_2) \Rightarrow (3x_1 + 1)^2 - 6 = (3x_2 + 1)^2 - 6 \Rightarrow 3x_1 + 1 = 3x_2 + 1$

$\Rightarrow x_1 = x_2$

Hence f is oe-one

Since with the modified co-domain = the range f,f is both o0ne-one and onto hence invertible

From (i) above for any

$y \neq [-5, \infty)$

$x = \frac{\sqrt{y+6-1}}{3}$

$f^{-1}[-5, \infty) \rightarrow [0, \infty), f^{-1}(y)$

$= \frac{\sqrt{y+6-1}}{3}$

30) Proving" is commutative 6

Proving" is associative

Getting identity element as (0,0)

Getting inverse of (a, b) as (- a, - b)

31) Given * on Q, defined by a * b = ab + 1 6

Let, a $\in Q$, b E Q then

ab $\in Q$,

and (ab + 1) $\in Q$,

$\Rightarrow$ a * b = ab + 1is defined on Q

:. "is a binary operation on Q.

Commutative:

a*b=ab+1

= ab + 1

= a*b=b*a

So * is commutative on Q.

Associative:

(a "b) * c = (ab + 1) * c = (ab + l)c + 1

= abc + c + 1

a " (b " c) = a " (bc + 1)

= a(bc + 1) + 1

= abc + a + 1

So * is associative on Q. 1

Identity Element: Let e $\in Q$ be the identity element,

then for every a

a * e = a and e * a = a

ac + 1= a and ca + 1= a

$\Rightarrow e = \frac{a-1}{a}, \frac{a-1}{a}$

e is not unique as it depend on 'a', hence identity element does not exist for *.

Inverse: since there is not identity element, hence there is no inverse.

32) A ^{2} = $\begin{pmatrix}5 & 0 & 8\\2 & 4 & 5\\8 & 0 & 13\end{pmatrix}$; A ^{3} = $\begin{pmatrix}21 & 0 & 34\\12 & 8 & 23\\34 & 0 & 55\end{pmatrix}$ **6**

L.H.S = $A^3 - 6A^2 + 7A + 2I$

$$= \begin{pmatrix}21 & 0 & 34\\12 & 8 & 23\\34 & 0 & 55\end{pmatrix} - \begin{pmatrix}30 & 0 & 48\\12 & 24 & 30\\48 & 0 & 78\end{pmatrix} + \begin{pmatrix}7 & 0 & 14\\0 & 14 & 7\\14 & 0 & 21\end{pmatrix} + \begin{pmatrix}2 & 0 & 0\\0 & 2 & 0\\0 & 0 & 2\end{pmatrix}$$

$$= \begin{pmatrix}0 & 0 & 0\\0 & 0 & 0\\0 & 0 & 0\end{pmatrix} = 0$$

= RHS

33) Applying $C_2 \to C_2 - C_1 \quad and \quad C_3 \to C_3 - C_1$ **6**

$$\begin{vmatrix}1 & 0 & 0\\1 + cosA & cosB - cosAcos^2B + cosB & cosC - cosAcos^2C - cosC\\cos^2A + cosA & cos^2A - cosA & -cos^2A - cosA\end{vmatrix} = 0$$

$R_3 \to R_3 - R_2$

$$\begin{vmatrix}1 & 0 & 0\\1 + cosA & cosB - cosA & cosC - cosA\\cos^2A - 1 & cos^2B - cos^2A & cos^2C - cosA\end{vmatrix} = 0$$

$C_3 \to C_3 - C_2$

(cos B - cos A) x (cos C -cos B)

$$\begin{vmatrix}1 & 0 & 0\\1 + cosA & 1 & 0\\cos^2A - 1 & cosB + cosA & cosC - cosA\end{vmatrix} = 0$$

$\therefore \quad (cosB - cosA) \times (cosC - cosA) \times (cosC - cosB)$

[1-0]=0 (Expanding along C_3)

$\therefore \quad -cosB = cosA \quad or \quad cosC = cosAorcosC = cosB$

$\Rightarrow \quad cosB = cosAorcosC = cosAorcosC = cosB$

$\Rightarrow \quad \angle B = \angle Aor\angle C = \angle Aor\angle C = \angle B$

$\Rightarrow \quad \triangle ABC$ is an isosceles triangle.

34)

$$|B| = \begin{vmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{vmatrix}$$

=1(3-0)-2(-1-0)-2(2-0)

=3+2-4 $\neq$ 0

i.e., B is invertible matrix.

$\Rightarrow$ B^{-1} exists.

Now

$$C_{11} = (-1)^{1+1}\begin{vmatrix} 3 & 0 \\ -2 & 1 \end{vmatrix} = 3 - 0 = 3$$

$$C_{12} = (-1)^{1+2}\begin{vmatrix} -1 & 0 \\ 0 & 1 \end{vmatrix} = -(-1-0) = 1$$

$$C_{13} = (-1)^{1+3}\begin{vmatrix} -1 & 3 \\ 0 & -2 \end{vmatrix} = 2 - 0 = 2$$

$$C_{21} = (-1)^{2+1}\begin{vmatrix} 2 & -2 \\ -2 & 1 \end{vmatrix} = -(2-4) = 2$$

$$C_{22} = (-1)^{2+2}\begin{vmatrix} 1 & -2 \\ 0 & 1 \end{vmatrix} = 1 - 0 = 1$$

$$C_{23} = (-1)^{2+3}\begin{vmatrix} 1 & 2 \\ 0 & -2 \end{vmatrix} = -(2-0) = 2$$

$$C_{31} = (-1)^{3+1}\begin{vmatrix} 2 & -2 \\ 3 & 0 \end{vmatrix} = 0 + 6 = 6$$

$$C_{32} = (-1)^{3+2}\begin{vmatrix} 1 & -2 \\ -1 & 0 \end{vmatrix} = -(0-2) = 2$$

$$C_{33} = (-1)^{3+3}\begin{vmatrix} 1 & 2 \\ -1 & 3 \end{vmatrix} = (3+2) = 5$$

$$= \frac{1}{1}\begin{bmatrix} 3 & 2 & 6 \\ 1 & 1 & 2 \\ 2 & 2 & 5 \end{bmatrix} = \begin{bmatrix} 3 & 2 & 6 \\ 1 & 1 & 2 \\ 2 & 2 & 5 \end{bmatrix}$$

$Now \quad (AB)^{-1} = B^{-1}.A^{-1}$

$$= \begin{bmatrix} 3 & 2 & 6 \\ 1 & 1 & 2 \\ 2 & 2 & 5 \end{bmatrix}\begin{bmatrix} 3 & -1 & 1 \\ -15 & 6 & -5 \\ 5 & -2 & 2 \end{bmatrix}$$

$$= \begin{bmatrix} 9-30+30 & -3+12-12 & 3-10+12 \\ 3-15+10 & -1+6-4 & 1-5+4 \\ 6-30+25 & -2+12-10 & 2-10+10 \end{bmatrix}$$

$$= \begin{bmatrix} 9 & -3 & 5 \\ -2 & 1 & 0 \\ 1 & 0 & 2 \end{bmatrix}$$