MATHS

BOOKS - VGS PUBLICATION-BRILLIANT

FINAL TOUCH (A SPECIAL PACKAGE OF THE MOST IMPORTANT QUESTIONS TO SUCCEED IN EXAMINATION EASILY)

Functions Very Short Answer Type Questions

1. If $A=\left\{0, \frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \frac{\pi}{2}\right\}$ and $f: A \to B$ is a surjection defined by $f(x)=\cos x$ then find B.

2. If $A = \{-2, -1, 0, 1, 2\}$ and $f: A \to B$ is a surjection defined by $f(x) = x^2 + x + 1$, then find B.

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3. If $f: R \to R, g: R \to R$ are defined by $f(x) = 3x - 1, g(x) = x^2 + 1$, find fog(2).

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4. If $f: R \to R, g: R \to R$ are defined by $f(x) = 4x - 1, g(x) = x^2 + 2$ then find (i) $(gof)(x)$

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5. If $f: R \to R, g: R \to R$ are defined by $f(x) = 4x - 1, g(x) = x^2 + 2$ then find (ii) $(gof)\left(\frac{a+1}{4}\right)$

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6. If $f: R \to R, g: R \to R$ are defined by $f(x) = 4x - 1, g(x) = x^2 + 2$ then find (iii) $fof(x)$

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7. If $f(x) = 2, g(x) = x^2, h(x) = 2x$ then find $(fogoh)(x)$

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8. If $f(x) = \frac{x+1}{x-1}, x \neq 1$ then find $(fofof)(x)$.

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9. Show that $f: Q \to Q, f(x) = 5x + 4$ is a bijection and find the inverse of 'f'.

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10. Find the inverse of the real function of $f(x) = ax + b, a \neq 0.$

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11. If $f = \{(4, 5), (5, 6), (6, -4)\}, g = \{(4, -4), (6, 5), (8, 5)\}$ find (i) $f + g$

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12. If $f = \{(4, 5), (5, 6), (6, -4)\}, g = \{(4, -4), (6, 5), (8, 5)\}$ find (iii) fg

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13. Find the domain of $\dfrac{1}{(x^2 - 1)(x + 3)}$

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14. Find the domian and range of the real function $f(x) = \sqrt{9 - x^2}$

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15. Find the domain of the real function $f(x) = \sqrt{x^2 - 25}$

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16. Find the domain of the real function $f(x) = \sqrt{4x - x^2}$

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17. The domain of $f(x) = \dfrac{\sqrt{2+x} + \sqrt{2-x}}{x}$ is

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18. Find the range of the real function $\frac{x^2-4}{x-2}$

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19. Determine whether the function $f(x)=\log\left(x+\sqrt{x^2+1}\right)$ is even or odd.

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Functions Long Answer Type Questions

1. If $f: A \rightarrow B, g: B \rightarrow C$ are two bijective functions then prove that $gof: A \rightarrow C$ is also a bijective function.

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2. If $f: A \rightarrow B, g: B \rightarrow C$ are two bijective functions then P.T $(\text{gof})^{-1}=f^{-1}\text{og}^{-1}$

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3. If $f: A \rightarrow B$ is a function and I_A, I_B are identify functions on A,B respectively then prove that $foI_A = f = I_B$ of

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4. If $f: A \rightarrow B$ is a bijective function then prove that

(i) $fof^{-1} = I_B$

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5. If $f: A \rightarrow B$ is a bijective function then prove that

(ii) $f^{-1}of = I_A$.

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6. If $f: A \to B$ and $g: B \to A$ are two functions such that $gof = I_A$ and $fog = I_B$ then $g = f^{-1}$.

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7. Let $f = \{(1, a), (2, c), (4, d), (3, b)\}$ and $g^{-1} = \{(2, a), (4, b), (1, c), (3, d)\}$ then show that $(gof)^{-1} = f^{-1}og^{-1}$.

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Mathematical Induction Long Answer Type Questions

1. $1.2.3. + 2.3.4 + 3.4.5 + \dots$ upto n terms $= \frac{n(n+1)(n+2)(n+3)}{4}$

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2. Using the principle of finite Mathematical Indcution prove that

$$2.3 + 3.4 + 4.5 + \ldots\ldots \text{ upto n terms} = \frac{n\left(n^2 + 6n + 11\right)}{3}.$$

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3. Using the principle of finite Mathematical Induction prove that

$$1^2 + \left(1^2 + 2^2\right) + \left(1^2 + 2^2 + 3^2\right) + \text{n terms} = \frac{n(n+1)^2(n+2)}{12}, \forall n \in N$$

.

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4. Prove by the method of induction,

$$\frac{1}{1.3} + \frac{1}{3.5} + \frac{1}{5.7} + \ldots + \frac{1}{(2n-1)(2n+1)} = \frac{n}{2n+1}$$

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5. Using the principle of finite Mathematical Induction prove the following:

(iii) $\frac{1}{1.4}+\frac{1}{4.7}+\frac{1}{7.10}+\ldots\ldots\ldots+\text{n terms}=\frac{n}{3n+1}.$

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6. Prove That $\frac{1^3}{1}+\frac{1^3+2^3}{1+3}+\frac{1^3+2^3+3^3}{1+3+5}$ + . . . upto n terms $=\frac{n}{24}\left[2n^2+9n+13\right]$

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7. Using the principle of Mathematical Induction, Show that $49^n+16n-1$ is divisible by 64, $\forall n \in N$.

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8. Using the principle of finite Mathematical Induction prove the following:

(v) $3.5^{2n+1} + 2^{3n+1}$ is divisible by $17, \forall n \in N$.

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Matrices Very Short Answer Type Questions

1. If $\begin{bmatrix} x-3 & 2y-8 \\ z+2 & 6 \end{bmatrix} = \begin{bmatrix} 5 & 2 \\ -2 & a-4 \end{bmatrix}$, then find the values of x,y,z and a.

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2. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}, B = \begin{bmatrix} 3 & 8 \\ 7 & 2 \end{bmatrix} 2X + A = B$ then find X.

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3. Find the trace of $\begin{bmatrix} 1 & 3 & -5 \\ 2 & -1 & 5 \\ 2 & 0 & 1 \end{bmatrix}$

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4. IF $A = \begin{bmatrix} 2 & 4 \\ -1 & k \end{bmatrix}$ and $A^2 = 0$ then find the value of k

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5. If $A = \begin{bmatrix} 2 & -4 \\ -5 & 3 \end{bmatrix}$ then find $A + A'$ and AA'.

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6. IF $A = \begin{bmatrix} 7 & -2 \\ -1 & 2 \\ 5 & 3 \end{bmatrix}, B = \begin{bmatrix} -2 & -1 \\ 4 & 2 \\ -1 & 0 \end{bmatrix}$ then find AB' and BA'

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7. If $A = \begin{bmatrix} -2 & 2 \\ 5 & 0 \\ -1 & 4 \end{bmatrix}, B = \begin{bmatrix} -2 & 3 & 1 \\ 4 & 0 & 2 \end{bmatrix}$ then find

$2A + B^T$

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8. If $A = \begin{bmatrix} -2 & 1 \\ 5 & 0 \\ -1 & 4 \end{bmatrix}, B = \begin{bmatrix} -2 & 3 & 1 \\ 4 & 0 & 2 \end{bmatrix}$ then find

$3B^T - A$

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9. If $A = \begin{bmatrix} -1 & 2 & 3 \\ 2 & 5 & 6 \\ 3 & x & 7 \end{bmatrix}$ is symmetric, find value of x.

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10. Is $\begin{bmatrix} 0 & 1 & 4 \\ -1 & 0 & 7 \\ -4 & -7 & 0 \end{bmatrix}$ symmetric or shew symmetric?

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11. If $\begin{vmatrix} 1 & 0 & 0 \\ 2 & 3 & 4 \\ 5 & -6 & x \end{vmatrix}$=45`, then find 'x'.

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12. If the inverse of the matrix $\begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}$ is $\frac{1}{11}\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ then the ascending order of a,b,c,d is

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13. Find the Adjoint and Inverse of the matrix $\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$

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14. If $A = \begin{bmatrix} 1 & 2 & 1 \\ -1 & 0 & 2 \\ 0 & 1 & -1 \end{bmatrix}$ find the rank A.

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15. Find the rank of $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$

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Matrices Short Answer Type Questions

1. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ then show that $A^2 - 4A - 5I = O.$

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2. If $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ and $E = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$ then show that $(aI + bE)^3 = a^3 I + 3a^2 bE$ where I is identify matrix of order 2.

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3. $\theta - \varphi = \frac{\pi}{2}$ then show that $\begin{bmatrix} \cos^2\theta & \cos\theta\sin\theta \\ \cos\theta\sin\theta & \sin^2\theta \end{bmatrix}\begin{bmatrix} \cos^2\phi & \cos\phi\sin\phi \\ \cos\phi\sin\phi & \sin^2\phi \end{bmatrix} = O$

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4. Prove that $\begin{vmatrix} b+c & c+a & a+b \\ a+b & b+c & c+a \\ a & b & c \end{vmatrix} = a^3 + b^3 + c^3 - 3abc$

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5. Show that the matrix $A = \begin{bmatrix} 1 & 2 & 1 \\ 3 & 2 & 3 \\ 1 & 1 & 2 \end{bmatrix}$ is non-singular and find A^{-1}.

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6. If A is a non-singular matrix then prove that $A^{-1} = \frac{adj A}{|A|}$.

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Matrices Long Answer Type Questions

1. Show that $\begin{vmatrix} a & b & c \\ a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{vmatrix} = abc(a-b)(b-c)(c-a).$

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2. Show that $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} = (a+b+c)^3$

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3. Show that

$$\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}^2 = \begin{vmatrix} 2bc-a^2 & c^2 & b^2 \\ c^2 & 2ac-b^2 & a^2 \\ b^2 & a^2 & 2ab-c^2 \end{vmatrix} = \left(a^3+b^3+c^3-3abc\right)^2$$

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4. $\begin{vmatrix} b+c & c+a & a+b \\ c+a & a+b & b+c \\ a+b & b+c & c+a \end{vmatrix} =$

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5. Find the value of x, if $\begin{vmatrix} x-2 & 2x-3 & 3x-4 \\ x-4 & 2x-9 & 3x-16 \\ x-8 & 2x-27 & 3x-64 \end{vmatrix} = 0.$

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6. Solve $3x+4y+5z=18, 2x-y+8z=13, 5x-2y+7z=20$ the system of equations using Cramer's rule.

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7. Solve the equations $2x-y+3z=9, x+y+z=6, x-y+z=2$ using Cramer's Rule.

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8. By Matrix inverse method, solve $3x + 4y + 5z = 18, 2x - y + 8z = 13, 5x - 2y + 7z = 20.$

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9. Solve the equation $2x - y + 3z = 8, \ -x + 2y + z = 4, 3x + y - 4z = 0$ by Matrix inversion method.

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10. By Gauss-Jordan method, solve $2x - y + 3z = 9, x + y + z = 6, x - y + z = 2.$

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11. By Gauss- Jordan method, solve $x+y+z=3, 2x+2y-z=3, x+y-z=1.$

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12. Apply the test of rank to examine whether the equations $x+y+z=6, x-y+z=2, 2x-y+3z=9$ is consistent or inconsistent and if consistent find the complete solution.

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Addition Of Vectors Very Short Answer Type Questions

1. Let $\bar{a}=4\bar{i}+2\bar{j}+5\bar{k}, \bar{b}=3\bar{i}+3\bar{j}.$ Find the unit vector in the direction of $\bar{a}+\bar{b}.$

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2. If $\bar{a} = 2\bar{i} + 4\bar{j} - 5\bar{k}, \bar{b} = \bar{i} + 3\bar{j} + \bar{k}, \bar{c} = 2\bar{J} + 2\bar{k},$ find the unit vector in the opposite direction of $\bar{a} + \bar{b} + \bar{c}$.

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3. If $\bar{a} = 2\bar{i} + 5\bar{j} + \bar{k}$ and $\bar{b} = 4\bar{i} + m\bar{j} + n\bar{k}$ are collinear vectors then find m,n.

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4. If the vectors $-3\bar{i} + 4\bar{j} + \lambda\bar{k}$ and $\mu\bar{i} + 8\bar{j} + 6\bar{k}$ are collinear vectors, then find λ and μ

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5. If the position vectors of the points A,B,C are $-2\bar{i} + \bar{j} - \bar{k}, \ -4\bar{i} + 2\bar{j} + 2\bar{k}, 6\bar{i} - 3\bar{j} - 13\bar{k}$ respectively and $\overline{AB} = \lambda\overline{AC}$ then find the value of λ.

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6. Find the vector equation of the line passing through the point $2\bar{i}+3\bar{j}+\bar{k}$ and parallel to the vector $4\bar{i}-2\bar{j}+3\bar{k}$

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7. Find the vectore equation of the line passing through the point $2\bar{i}+\bar{j}+3\bar{k}$ parallel to vector $4\bar{i}-2\bar{j}+3\bar{k}$.

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8. OABC is a parallelogram. If $\overline{OA}=\bar{a}, \overline{OC}=\bar{c}$, find the vector equation of the side BC.

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9. Find the vector equation of the line passing through the points $2\bar{i} + \bar{j} + 3\bar{k}$ and $-4\bar{i} + 3\bar{j} - \bar{k}$.

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10. Find the vector equation of the plane passing through the points $\bar{i} - 2\bar{j} + 5\bar{k}, \ -5\bar{j} - \bar{k}, \ -3\bar{i} + 5\bar{j}$.

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11. Find the vector equation of plane passing through Points (0,0,0) , (0,5,0) and (2,0,1)

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Addition Of Vectors Short Answer Type Questions

1. If $\bar{i}, \bar{j}, \bar{k}$ are unit vectors along the positive directions of the coordinate axes, then shown that the four points $4\bar{i}+5\bar{j}+\bar{k}, -\bar{j}-\bar{k}, 3\bar{i}+9\bar{j}+4\bar{k}$ and $-4\bar{i}+4\bar{j}+4\bar{k}$ are coplanar

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2. $\bar{a}, \bar{b}, \bar{c}$ are non-coplanar vectors. Prove thate the following four points are coplanar

$-\bar{a}+4\bar{b}-3\bar{c}, 3\bar{a}+2\bar{b}-5\bar{c}$

$-3\bar{a}+8\bar{b}-5\bar{c}, -3\bar{a}+2\bar{b}+\bar{c}$

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3. If the points whose position vectors are $3\bar{i}-2\bar{j}-\bar{k}, 2\bar{i}+3\bar{j}-4\bar{k}, -\bar{i}+\bar{j}+2\bar{k}, 4\bar{i}+5\bar{j}+\lambda\bar{k}$ are coplanar, then show that $\lambda = -\frac{146}{17}$.

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4. If ABCDEF is a regular hexagon with centre O , then P.T

$\overline{AB}+\overline{AC}+\overline{AD}+\overline{AE}+\overline{AF}=3\overline{AD}=6\overline{AO}$

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5. If O is the circumcentre, 'H' is the orthocentre of triangle ABC, then show that

$\overline{OA}+\overline{OB}+\overline{OC}=\overline{OH}$

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6. If 'O' is circumcente and 'H' is orthocentre of ΔABC, then

List-I	List-II
A) $\overline{OA}+\overline{OB}+\overline{OC}$	1) $\frac{1}{2}\overline{HO}$
B) $\overline{HA}+\overline{HB}+\overline{HC}$	2) $2\overline{HO}$
C) $\overline{AH}+\overline{HB}+\overline{HC}$	3) $2\overline{AO}$
D) $\overline{OG}$	4) $\frac{1}{3}\overline{OH}$
	5) $\overline{OH}$

The correct matching is

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7. Find the vector equation of the plane passing through the points. $4\bar{i}-3\bar{j}-\bar{k}, 3\bar{i}+7\bar{j}-10\bar{k}$ and $2\bar{i}+5\bar{j}-7\bar{k}$ and show that the point $\bar{i}+2\bar{j}-3\bar{k}$ lies in the plane.

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8. Show that the line joining the pair of points $6\bar{a}-4\bar{b}+4\bar{c}, -4\bar{c}$ and the line joining the pair of points, $-\bar{a}-2\bar{b}-3\bar{c}, \bar{a}+2\bar{b}-5\bar{c}$ intersect at the point $-4\bar{c}$ when $\bar{a}, \bar{b}, \bar{c}$ are non-coplanar vectors.

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Product Of Vectors Very Short Answer Type Questions

1. If $\bar{a}=\bar{i}+2\bar{j}-3\bar{k}$ and $\bar{b}=3\bar{i}-\bar{j}+2\bar{k}$, then show that $\bar{a}+\bar{b}$ and $\bar{a}-\bar{b}$are and perpendicular to each other .

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2. If the vectors $2\bar{i} + \lambda\bar{j} - \bar{k}$ and $4\bar{i} - 2\bar{j} + 2\bar{k}$ are perpendicular to each other than find λ.

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3. If vectors $\lambda\bar{i} - 3\bar{j} + 5\bar{k}, 2\lambda\bar{i} - \lambda\bar{j} - \bar{k}$ are perpendicular to each other find λ.

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4. Find the angle between the vectors $\bar{i} + 2\bar{j} + 3\bar{k}$ and $3\bar{i} - \bar{j} + 2\bar{k}$.

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5. If $\bar{a} = \bar{i} - \bar{j} - \bar{k}, \bar{b} = 2\bar{i} - 3\bar{j} + \bar{k}$ then find the projection vector of $\bar{b}$ on $\bar{a}$ and its magnitude.

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6. Find the area of the parallelgram whose adjacent sides are $\bar{a} = 2\bar{i} - 3\bar{j}, \bar{b} = 3\bar{i} - \bar{k}$

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7. Find the area of the parallelogram whose diagonals are $3\bar{i} + \bar{j} - 2\bar{k}, \bar{i} - 3\bar{j} + 4\bar{k}$

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8. Find the volume of the tetrahedron having the edges $,\bar{i} + \bar{j} + \bar{k}, \bar{i} - \bar{j}, \bar{i} + 2\bar{j} + \bar{k}.$

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9. Find unit vector perpendicular to both $\bar{i}+\bar{j}+\bar{k}$ and $2\bar{i}+\bar{j}+3\bar{k}$.

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10. Find anle between planes $\bar{r}.\left(2\bar{i}-\bar{j}+2\bar{k}\right)=3, \bar{r}.\left(3\bar{i}+6\bar{j}+\bar{k}\right)=4$

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Product Of Vectors Short Answer Type Questions

1. If $\bar{a}=(1,\ -1,\ -6), \bar{b}=(1,\ -3,4), \bar{c}=(2,\ -5,3)$, then compute $\bar{a}\times\left(\bar{b}\times\bar{c}\right)$.

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2. If $\bar{a} = 2\bar{i} + \bar{j} - \bar{k}, \bar{b} = -\bar{i} + 2\bar{j} - 4\bar{k}, \bar{c} = \bar{i} + \bar{j} + \bar{k}$ then find $(\bar{a} \times \bar{b}).(\bar{b} \times \bar{c})$.

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3. If $\bar{a} = 2\bar{i} + 3\bar{j} + 4\bar{k}, \bar{b} = \bar{i} + \bar{j} - \bar{k}, \bar{c} = \bar{i} - \bar{j} + \bar{k}$, compute $\bar{a}x(\bar{b}x\bar{c})$ and verify that it is perpendicular to $\bar{a}$.

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4. Find the area of the triangle formed with the points $A(1, 2, 3), B(2, 3, 1), C(3, 1, 2)$.

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5. Find the volume of the tetrahedron, whose vertices are (1,2,1),(3,2,5) , (2,-1,0) and (-1,0,1).

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6. Find the unit vector perpendicular to the plane passing through the points $(1, 2, 3), (2, -1, 1)$ and $(1, 2, -4)$.

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7. Prove that vector method the angle between any two diagonals of a cube is $\cos^{-1}\left(\frac{1}{3}\right)$.

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Product Of Vectors Long Answer Type Questions

1. If $\bar{a} = \bar{i} - 2\bar{j} + \bar{k}, \bar{b} = 2\bar{i} + \bar{j} + \bar{k}, \bar{c} = \bar{i} + 2\bar{j} - \bar{k},$ then find $\bar{a} \times (\bar{b} \times \bar{c})$ and $\left|(\bar{a} \times \bar{b}) \times \bar{c}\right|$.

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2. If $a = \bar{i} - 2\bar{j} - 3\bar{k}, \bar{b} = 2\bar{i} + \bar{j} - \bar{k}, \bar{c} = \bar{i} + 3\bar{j} - 2\bar{k}$ verify that $\bar{a} \times (\bar{b} \times \bar{c}) \neq (\bar{a} \times \bar{b}) \times \bar{c}$.

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3. If $\bar{a} = \bar{i} - 2\bar{j} + \bar{k}, \bar{b} = 2\bar{i} + 2\bar{j} + \bar{k}, \bar{c} = 3\bar{i} + 2\bar{j} - \bar{k}$, then find $\bar{a} \times (\bar{b} \times \bar{c})$

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4. If $\bar{a} = \bar{i} - 2\bar{j} + \bar{k}, \bar{b} = 2\bar{i} + 2\bar{j} + \bar{k}, \bar{c} = 3\bar{i} + 2\bar{j} - \bar{k}$, then find $\left|(\bar{a} \times \bar{b}) \times \bar{c}\right|$

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5. Find the equation of the plane passing through the point A=(2,3,-1),B=(4,5,2),C=(3,6,5).

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6. Find the shortest distance between the skew lines .

$\bar{r}=(6\bar{i}+2\bar{j}+2\bar{k})+t(\bar{i}-2\bar{j}+2\bar{k})$ and $\bar{r}=(-4\bar{i}-\bar{k})+s(3\bar{i}-2\bar{j}$

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7. If A=(1, -2, -1), B= (4, 0, -3), C = (1, 2, -1), D=(2, -4, -5)`, then distance between AB and CD is

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8. $\bar{a}, \bar{b}, \bar{c}$ are three vectros, then prove that:

$(\bar{a}\times\bar{b})\times\bar{c}=(\bar{a}.\bar{c})\bar{b}-(\bar{b}.\bar{c})\bar{a}.$

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9. Prove that $\bar{a}x[\bar{a}x(\bar{a}x\bar{b})]=(\bar{a}.\bar{a})(\bar{b}x\bar{a}).$

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Trigonometric Ratios Upto Transformations Very Short Answer Type Questions

1. If $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$, then prove that $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$.

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2. Show that $\dfrac{1}{\sin 10^\circ} - \dfrac{\sqrt{3}}{\cos 10^\circ} = 4$.

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3. If $\dfrac{\sin\alpha}{a} = \dfrac{\cos\alpha}{b}$, then $a\sin 2\alpha + b\cos 2\alpha =$

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4. Prove that $\cos 100^\circ \cos 40^\circ + \sin 100^\circ . \sin 40^\circ = \frac{1}{2}$

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5. Prove that $4(\cos 66^\circ + \sin 84^\circ) = \sqrt{3} + \sqrt{15}$

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6. Prove that $\cos 55^\circ + \cos 65^\circ + \cos 175^\circ = 0.$

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7. Find the value of $\cos 42^\circ + \cos 78^\circ + \cos 162^\circ$

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8. Find the value of $\sin 330^\circ . \cos 120^\circ + \cos 210^\circ . \sin 300^\circ .$

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9. Prove that $\sin 50^\circ - \sin 70^\circ + \sin 10^\circ = 0$

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10. Prove that $\dfrac{\cos 9^\circ + \sin 9^\circ}{\cos 9^\circ - \sin + 9^\circ} = \cot 36^\circ.$

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11. Prove that $\sin^2 42^\circ - \cos^2 78^\circ = \dfrac{\sqrt{5}+1}{8}.$

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12. Find the period of $f(x) = \cos(3x+5)+7$

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13. Find the period of $f(x) = \cos\left(\frac{4x+9}{5}\right)$

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14. Find the period of $\tan\left(x + 4x + 9x + \dots\dots + n^2 x\right)$ (n any positive integer)

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15. Find the sine function whose period is 2/3.

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16. The minimum value of $7\cos x - 24\sin x + 5$ is

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17. Find max. and min. of $3 \sin x + 4 \cos x$.

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18. Find the range of $13 \cos x + 3\sqrt{3} \sin x - 4$

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19. Find the value of $\sin^2 82\frac{1}{2} - \sin^2 22\frac{1}{2}$.

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20. Sketch the graph of $\sin x$ in the intervals $| - \pi, \pi]$

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Trigonometric Ratios Upto Transformations Short Answer Type Questions

1. If $A+B=45^\circ$, then prove that

$(i)(1+\tan A)(1+\tan B)=2(ii)(\cot A-1)(\cot B-1)=2$

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2. Prove that $\sqrt{3}\text{cosec}20^\circ-\sec 20^\circ=4.$

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3. Prove that $\tan A+\cot A=2\cos ec2A$

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4. Prove that $\cot A-\tan A=2\cot 2A$

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5. Show that $\sin^4. \frac{\pi}{8} + \sin^4. \frac{3\pi}{8} \sin^4. \frac{5\pi}{8} + \sin^4. \frac{7\pi}{8} = \frac{3}{2}$

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6. Show that $\cos^4 \frac{\pi}{8} + \cos^4 \frac{3\pi}{8} + \cos^4 \frac{5\pi}{8} + \cos^4 \frac{7\pi}{8} = \frac{3}{2}$

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7. Prove that:

$$\left(1 + \cos \frac{\pi}{10}\right)\left(1 + \cos \frac{3\pi}{10}\right)\left(1 + \cos \frac{7\pi}{10}\right)\left(1 + \cos \frac{9\pi}{10}\right) = \frac{1}{16}$$

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8. If A is not an integral multiple of (π), prove that $\cos A \cos 2A \cos 4A \cos 8A = \frac{\sin 16A}{16 \sin A}$ Hence deduce that $\cos. \frac{2\pi}{15}. \cos. \frac{4\pi}{15}. \cos. \frac{8\pi}{18}. \cos. \frac{16\pi}{15} = \frac{1}{16}$

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9. If a, b, c are non zero real numbers and α, β are the solutions of the equation a $\cos\theta + b\sin\theta = c$, then show that

$$\sin\alpha + \sin\beta = \frac{2bc}{a^2 + b^2}$$

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10. If a, b, c are non zero real numbers and α, β are the solutions of the equation a $\cos\theta + b\sin\theta = c$, then show that

$$\sin\alpha\sin\beta = \frac{c^2 - a^2}{a^2 + b^2}$$

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Trigonometric Ratios Upto Transformations Long Answer Type Questions

1. If $A + B + C = \frac{3\pi}{2}$, prove that $\cos 2A + \cos 2B + \cos 2C = 1 - 4\sin A\sin B\sin C$.

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2. If $A+B+C=180^\circ$ then prove that the following

$\cos A+\cos B+\cos C=1+4\sin\frac{A}{2}\sin\frac{B}{2}\sin\frac{C}{2}$

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3. In ΔABC, prove that

$\cos A+\cos B-\cos C=-1+4\cos\frac{A}{2}.\cos\frac{B}{2}.\sin\frac{C}{2}.$

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4. If $A, B, C$are angles of a triangle, then

$P.T\sin^2.\frac{A}{2}+\sin^2.\frac{B}{2}-\sin^2.\frac{C}{2}=1-2\cos.\frac{A}{2}\cos.\frac{B}{2}\sin.\frac{C}{2}$

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5. If $A+B+C=\pi,$ then prove that $\cos^2\left(\frac{A}{2}\right)+\cos^2\left(\frac{B}{2}\right)+\cos^2\left(\frac{C}{2}\right)=2\left(1+\sin.\ \frac{A}{2}\sin.\ \frac{B}{2}\sin.\ \frac{C}{2}\right)$

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6. If A, B, C are the angles in a triangle then prove that $\sin.\ \frac{A}{2}+\sin.\ \frac{B}{2}+\sin.\ \frac{C}{2}=1+4\sin\left(\frac{\pi-A}{4}\right)\sin\left(\frac{\pi-B}{4}\right)\sin\left(\frac{\pi-C}{4}\right.$

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7. In triangle ABC, prove that $\cos.\ \frac{A}{2}+\cos.\ \frac{B}{2}+\cos.\ \frac{C}{2}=4\cos.\ \frac{\pi-A}{4}\cos.\ \frac{\pi-B}{4}\cos.\ \frac{\pi-C}{4}$

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8. In $\Delta ABC,$ prove that $\cos.\ \frac{A}{2}+\cos.\ \frac{B}{2}-\cos.\ \frac{C}{2}=4\cos.\ \frac{\pi+A}{4}\cos.\ \frac{\pi+B}{4}\cos.\ \frac{\pi-C}{4}$

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9. If $A+B+C=2S$, then prove that

$$\sin(S-A)+\sin(S-B)+\sin C=4\cos\left(\frac{S-A}{2}\right)\cos\left(\frac{S-B}{2}\right)\frac{\sin C}{2}$$

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10. If $A+B+C=2S$, then prove that

(i)

$$\sin(S-A)+\sin(S-B)+\sin C=4\cos.\ \frac{S-A}{2}\cos.\ \frac{S-B}{2}\sin.\ \frac{C}{2}$$

(ii)

$$\cos(S-A)+\cos(S-B)+\cos C=\ -1+4\cos.\ \frac{S-A}{2}\cos.\ \frac{S-B}{2}\cos.$$

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Trigonometric Equations Very Short Answer Type Questions

1. Solve $\sin x + \sqrt{3}\cos x = \sqrt{2}$.

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2. Solve $\sqrt{2}(\sin x + \cos x) = \sqrt{3}$

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3. Solve the following equations

$\sqrt{3}\sin\theta - \cos\theta = \sqrt{2}$

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4. Solve $2\cos^2\theta - \sqrt{3}\sin\theta + 1 = 0$.

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5. Solve the equation $\cot^2 x - (\sqrt{3}+1)\cot x + \sqrt{3} = 0, 0 < x < \frac{\pi}{2}$

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6. Find all values of x in $(-\pi, \pi)$ satisfying the equation $8^{1+\cos x+\cos^2 x+\ldots} = 4^3$.

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7. Solve the equation $1+\sin^2\theta = 3\sin\theta\cos\theta$.

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8. Solve $\sin\theta + \sin 5\theta = \sin 3\theta, 0 < \theta < \pi$.

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Inverse Trigonometric Functions Short Answer Type Questions

1. Prove that $\sin^{-1}\left(\frac{4}{5}\right)+\frac{\sin^{-1}7}{25}=\frac{\sin^{-1}117}{125}$.

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2. Prvoe that $\sin^{-1}\frac{3}{5}+\cos^{-1}\frac{12}{13}=\cos^{-1}\frac{33}{65}$.

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3. Prove that $2\sin^{-1}\left(\frac{3}{5}\right)-\cos^{-1}\left(\frac{5}{13}\right)=\cos^{-1}\left(\frac{323}{325}\right)$

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4. P.T. $\cos^{-1}\left(\frac{4}{5}\right)+\sin^{-1}\left(\frac{3}{\sqrt{34}}\right)=\tan^{-1}\left(\frac{27}{11}\right)$.

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5. Prove that : $\tan^{-1}\frac{1}{2}+\tan^{-1}\frac{1}{5}+\tan^{-1}\frac{1}{8}=\frac{\pi}{4}$

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6. Prove that $\cos\left(2\tan^{-1}\frac{1}{7}\right)=\sin\left(2\tan^{-1}\frac{3}{4}\right)$.

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7. Prove that $\sin^{-1}\left(\frac{4}{5}\right)+2\tan^{-1}\left(\frac{1}{3}\right)=\frac{\pi}{2}$.

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8. If $\cos^{-1}p+\cos^{-1}q+\cos^{-1}r=\pi$ then,

$P.T.\,p^2+q^2+r^2=2pqr=1$

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9. Solve

$$3\sin^{-1}\left(\frac{2x}{1+x^2}\right) - 4\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right) + 2\tan^{-1}\left(\frac{2x}{1-x^2}\right) = \frac{\pi}{3}$$

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Hyperbolic Functions Very Short Answer Type Questions

1. If $\sin hx = \frac{3}{4}$, then find $\cos h(2x)$ and $\sin h(2x)$

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2. If $\cos hx = \frac{5}{2}$ then cos h(2x) =

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3. If $\cos hx = \frac{5}{2}$, then find

$\sin h(2x)$

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4. If $\sin hx = 3$, then show that $x = \log_e(3+\sqrt{10})$.

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5. $\tan h^{-1}\left(\frac{1}{2}\right) =$

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6. Prove that $\cos h^4 x - \sin h^4 x = \cos h(2x)$

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7. Prove that $(\cosh x - \sinh x)^n = \cosh(nx) - \sinh(nx)$

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8. Prove that $(\cosh x+\sinh x)^n=\cosh(nx)+\sinh(nx)$

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Properties Of Triangles Short Answer Type Questions

1. Show that $\frac{\cos A}{a}+\frac{\cos B}{b}+\frac{\cos C}{c}=\frac{a^2+b^2+c^2}{2abc}$

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2. Prove that $\cot A+\cot B+\cot C=\frac{a^2+b^2+c^2}{4\,\triangle}$.

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3. $a^2\cot A+b^2\cot B+c^2\cot C=$

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4. Show that

$$\cot\frac{A}{2}+\cot\frac{B}{2}+\cot\frac{C}{2}=\frac{S^2}{\Delta}$$

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5. if $a-b=3 \text{ and } a^2+b^2=29$, find the value of ab.

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6. If $a=2 \text{ and } b=3then(a-b)^2$ is what?

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7. If $a=5, b=2$, find $(a+b)^2$.

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8. Show that $\dfrac{1}{r^2}+\dfrac{1}{r_1^2}+\dfrac{1}{r_2^2}+\dfrac{1}{r_3^2}=\dfrac{a^2+b^2+c^2}{\Delta^2}$

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9. Show that $r_1+r_2+r_3-r=4R$

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Properties Of Triangles Long Answer Type Questions

1. If $a=(b+c)\cos\theta,\quad \text{then prove that} \sin\theta=\dfrac{2\sqrt{bc}}{b+c}\cos\left(\dfrac{A}{2}\right)$

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2. If $\sin\theta=\dfrac{a}{b+c}$ then show that $\cos\theta=\dfrac{2\sqrt{bc}}{b+c}\cos\left(\dfrac{A}{2}\right)$

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3. If $a=(b-c)\sec\theta$, then prove that $\tan\theta=\frac{2\sqrt{bc}}{b-c}\frac{\sin A}{2}$.

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4. Show that $a\cos^2\frac{A}{2}+b\cos^2\frac{B}{2}+c\cos^2\frac{C}{2}=s+\frac{\Delta}{R}$.

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5. In $\Delta ABC\quad\text{prove that}\quad\cos^2.\frac{A}{2}+\cos^2.\frac{B}{2}+\cos^2.\frac{C}{2}=2+\frac{r}{2R}$

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6. In a

$\Delta ABC\ \text{ if }\ a=13, b=14, c=15\ \text{ then show that }\ R=\frac{65}{8}, r=4, r_1=$

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7. If $r_1 = 2, r_2 = 3, r_3 = 6$ and $r = 1,$ prove that $a = 3, b = 4$ and $c = 5.$

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8. In a ΔABC if $r_1 = 8, r_2 = 12, r_3 = 24$ find a, b,c .

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9. If p_1, p_2, p_3 are altitudes of a ΔABC then show that

$$\frac{1}{p_1} + \frac{1}{p_2} + \frac{1}{p_3} = \frac{1}{r}$$

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10. If P_1, P_2, P_3 are altitudes of a ΔABC then show that

$$\frac{1}{P_1} + \frac{1}{P_2} - \frac{1}{P_3} = \frac{1}{r_3}$$

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11. If p_1, p_2, p_3 are the lengths of the altitudes from the vertices A,B,C of ΔABC to the opposite sides respectively then prove that

$$p_1p_2p_3 = \frac{(abc)^2}{8R^3} = \frac{8\Delta^3}{abc}$$

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