MATHS

BOOKS - UNITED BOOK HOUSE

HIGHER SECONDARY EXAMINATION 2020.

Exercise

1. $\vec{a}$ and $\vec{b}$ are two vectors such that $\left|\vec{a}+\vec{b}\right|=\left|\vec{a}-\vec{b}\right|$ then angle between $\vec{a}$ and $\vec{b}$ is

A. 30°

B. 60°

C. 90°

D. 120°

Answer:

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2. If ω be an imaginary cube root of 1 then the value of $\begin{vmatrix} 1 & \omega^2 & \omega \\ \omega & 1 & \omega^2 \\ \omega^2 & \omega & 1 \end{vmatrix}$ is

A. -1

B. ω^3

C. 0

D. $-\omega^2$

Answer:

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3. Let IR be the set of real numbers and the mapping $f: IR \to IR$ and $g: IR \to IR$ be define by $f(x) = 5 - x^2$ and g(x)=3x-4, then the value of (fog)(-1) is

A. 8

B. -44

C. 54

D. 16

Answer:

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4. a straight line makes an angle 45° with positive direction of x-axis and 60° with positive direction of z-axis. If the line makes and angle θ with positive direction of y-axis thenθ is equal to-

A. 45°

B. 60°

C. 120°

D. 135°

Answer:

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5. Value of $\int_0^{\frac{\pi}{2}} \left(\sin^{2200} x - \cos^{2200} x\right) dx$ is-

A. 0

B. 1

C. $\frac{1}{2200}$

D. $\frac{1}{1100}$

Answer:

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6. The principal value of $\sin^{-1}\left(\sin\left(\frac{5\pi}{6}\right)\right)$ is-

A. $\frac{\pi}{6}$

B. $\frac{5\pi}{6}$

C. $\frac{7\pi}{6}$

D. $\frac{\pi}{3}$

Answer:

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7. Evaluate : $\sec^2\left(\tan^{-1}2\right) + \operatorname{cosec}^2\left(\cot^{-1}3\right).$

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8. Show that $\begin{vmatrix} 1 & \log_a b & \log_a c \\ \log_b a & 1 & \log_b c \\ \log_c a & \log_c b & 1 \end{vmatrix} = 0,$

(a>0,b>0,c>0)

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9. Find the deferential equation of $xy = Ae^x + Be^{-x} + x^2$ by eleminating A and B (A,B are constants).

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10. If $x^2 = a^{\sin^{-1} t}$ and $y^2 = a^{\cos^{-1} t}$ then show that $\frac{dy}{dx} = -\frac{y}{x}$.

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11. If $f(x) = \frac{\sin 5x}{2x}$ (when $x \neq 0$)

$= \frac{5k}{4}$(when x= 0), and f(x) is continuous at x=0, find k.

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12. If x>0,y>0 and xy= 100, find the minimum value of (x+y)

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13. Evaluate: $\int\left(\frac{\cos x+x \sin x}{x(x+\cos x)}\right) dx.$

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14. If f(x) = -f(-x) then show that $\int_{-a}^{a} f(x)dx = 0.$

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15. Find a vector of magnitude 14 in the direction of the vector $-3\hat{i}+6\hat{j}-2\hat{k}$.

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16. Find the direction cosines of a straight line which is situate on yz-plane and inclined at an angle 60° with poistive direction of z-axis.

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17. If $P(A) = \frac{1}{4}, P(B) = \frac{1}{3}$ and $P(A - B) = \frac{1}{6}$ then verify whether a and B are two independent event or not.

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18. The mean and variance of a binomial distribution B(n,p|) are 4 and 3.2 respectively. Find the value of n and p.

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19. *' is an operation defined on Z set of all integers as a*b = a+b-2 for all $a, b \in z$.

Find identity element of *'

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20. *' is an operation defined on Z set of all integers as a*b = a+b-2 for all $a, b \in z$.

Find the inverse of an element $a \in Z$.

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21. Show that

$$\sin^{-1}\left(\frac{12}{13}\right)+\cos^{-1}\left(\frac{4}{5}\right)+\tan^{-1}\left(\frac{63}{16}\right)=\pi.$$

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22. If

$$A=\begin{bmatrix}0 & 6 & 7\\ -6 & 0 & 8\\ 7 & -8 & 0\end{bmatrix}, B=\begin{bmatrix}0 & 1 & 1\\ 1 & 0 & 2\\ 1 & 2 & 0\end{bmatrix}, C=\begin{bmatrix}2\\ -2\\ 3\end{bmatrix}$$

Calculate AC, BC and (A+B)C. Also show that(A+B)C=AC+BC.

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23. If $A = \begin{pmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{pmatrix}$ show that $A = \begin{pmatrix} \cos n\theta & \sin n\theta \\ -\sin n\theta & \cos n\theta \end{pmatrix}$ n= positive integer.

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24. show that $\begin{vmatrix} 1 & x & x^2 \\ x^2 & 1 & x \\ x & x^2 & 1 \end{vmatrix} = \left(1 - x^3\right)^2$

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25. If $(\cos x)^y = (\cos y)^x$ then show that $\frac{dy}{dx} = \frac{y\tan x + \log\cos y}{x\tan y + \log\cos x}$.

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26. If $y = \left(\tan^{-1} x\right)^2$, then show that $\left(1+x^2\right)^2 \frac{d^2y}{dx^2} + 2x\left(1+x^2\right)\frac{dy}{dx} = 2.$

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27. Evaluate: $\int \frac{2dx}{(1-x)(1+x^2)}$

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28. Evaluate: $\int \left(\sqrt{\tan x} + \sqrt{\cot x}\right) dx$

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29. Solve: $xy\frac{dy}{dx} = (x+2)(y+2)$, given x= 1, when y =-1.

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30. Solve: $x^2dy + \left(xy + y^2\right)dx = 0$, given x=1 and y = 1.

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31. If $\vec{a}, \vec{b}, \vec{c}$ be three vectors such that $\vec{a} + \vec{b} + \vec{c} = 0$, $|\vec{a}| = 3$, $|\vec{b}| = 5$ and $|\vec{c}| = 7$ find the angle between the vectors $\vec{a}$ and $\vec{b}$.

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32. Show that the points A=(2,-1,1),B=(1,-3,-5) and C=(3,-4,-4) are vertices of a right angled triangle (using vector method).

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33. Show that: $\int_0^1 \left(\frac{\log(1+x)}{1+x^2}\right) dx = \frac{\pi}{8}\log 2.$

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34. Let A and B be two events such that $P(A) = \frac{1}{3}, P(B) = \frac{1}{4}$ and $P(A \cap B) = \frac{1}{4}$.

Find $P(A/B), P(B/A), P(A \cup B)$.

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35. Prove that all points of the curve $y^2 = 4a\left[x + a\frac{\sin x}{a}\right]$ at which the langent is

parallel to the axis of x, lie on a parabola.

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36. Solve: $\frac{dy}{dx} - 3y \cot x = \sin 2x$, given y=2 when $x = \frac{\pi}{2}$

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37. Find two positive numbers x and y such that x + y = 60 and xy^3 is maximum.

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38. Evaluate the following integral $\int_1^3 (x^2 + x)dx.$

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39. A variable plane which is at a constant distance 3p from origin cuts the coordinate axes at A,B,C respectively. Show that locus of the centroid of the $\triangle ABC$ is $\frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2} = \frac{1}{p^2}.$

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40. Find the equation of the plane which passes through the points (3,4,1) and (0,1,0) and parallel to the line $\frac{x+3}{2} = \frac{y-3}{7} = \frac{z-2}{5}$

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