MATHS

BOOKS - GURUKUL BOOKS & PACKAGING MATHS (HINGLISH)

FEBRUARY 2020

Others

1. In $\triangle ABC$, if a=2,b=3 and $\sin A = \dfrac{2}{3}$, then $\angle B =$

A. $\dfrac{\pi}{4}$

B. $\dfrac{\pi}{2}$

C. $\dfrac{\pi}{3}$

D. $\dfrac{\pi}{6}$

Answer:

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2. If $\vec{a} = 3\hat{i} - \hat{j} + 4\hat{k}, \vec{b} = 2\hat{i} + 3\hat{j} - \hat{k}$ and $\vec{c} = -5\hat{i} + 2\hat{j} + 3\hat{k}$, then $\vec{a} \cdot \left(\vec{b} \times \vec{c}\right)$ is

A. 100

B. 110

C. 109

D. 108

Answer:

3. The cartesian equation of the line passing through the points A(4, 2, 1) and B (2, -1, 3) is

A. $\dfrac{x + 4}{2} = \dfrac{y - 2}{3} = \dfrac{z - 1}{-2}$

B. $\dfrac{x - 4}{-2} = \dfrac{y - 2}{-3} = \dfrac{z - 1}{-2}$

C. $\dfrac{x - 4}{2} = \dfrac{y - 2}{3} = (z - 1)(-2)$

D. $\dfrac{x - 4}{-2} = \dfrac{y - 2}{3} = \dfrac{z - 1}{-2}$

Answer:

4. If the line $\vec{r} = \left(\hat{i} - 2\hat{j} + 3\hat{k}\right) + \lambda\left(2\hat{i} + \hat{j} + 2\hat{k}\right)$ is parallel to the plane $\vec{r}\cdot\left(3\hat{i} - 2\hat{j} + m\hat{k}\right) = 10$ then value of m is

   A. -2

   B. 2

   C. ± 2

   D. 0

Answer:

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5. If

$$\{(f(x) = 1 - x), (f \text{ or } 0 < x \leq 1), (= k, f \text{ or } x = 0)\}$$

is continuous at x = 0, then k =

A. 0

B. -1

C. 2

D. 1

Answer:

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6. The function $f(x) = x^x$ is minimum at x =

A. e

B. -e

C. $\dfrac{1}{e}$

D. $-\dfrac{1}{e}$

Answer:

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7. If $\displaystyle\int_{0^k} 4x^3\,dx = 16$ then the value of k is

A. 1

B. 2

C. 3

D. 4

Answer:

8. Order and degree of differential equations

$$\frac{d^4y}{dx^4} = \left[1 + \left(\frac{dy}{dx}\right)^2\right]^3 \text{ respectively are}$$

A. order:1, degree:4

B. order:4, degree:1

C. order:6, degree:1

D. order:1, degree:6

Answer:

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9. Answer the following questions: Write the dual of

$p \wedge {\sim} p = F$

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10. Answer the following questions: Find the general

solution of $\tan 2x = 0$

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11. Answer the following questions: Differentiate $\sin\left(x^2 + x\right)$ w.r.t. x

12. Answer the following questions: If $X \to B(n, p)$ and $n = 10.$ $E(X) = 5$, then find the value of p.

A. -

B.

C.

D.

Answer:

13. Using truth table verify that $\sim(p \vee q) \equiv \sim p \wedge \sim q$

14. Find the matrix of co - factors for matrix $\begin{bmatrix} 1 & 3 \\ 4 & -1 \end{bmatrix}$

15. Find the angle between the lines represented by

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

16. $\bar{a}$ and $\bar{b}$ are non-collinear vectors. If $\bar{c} = (x-2)\bar{a} + \bar{b}$ and $\bar{d} = (2x+1)\bar{a} - \bar{b}$ are collinear , then find the value of x

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17. If a line makes angles $90°$, $135°$, $45°$ with X,Y and Z axes respectively , then find its direction cosines.

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18. Express the following circuit in symbolic form

S_1, S_2, S_3

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19. Differentiate $\log(\sec x + \tan x)$ w.r.t. x

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20. Evaluate $\int \dfrac{1}{x^2 + 4x + 8} dx$

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21. Evaluate $\displaystyle\int_0^{\frac{\pi}{2}} \cos^2 x\, dx$

22. Solve the differential equation $\dfrac{dy}{dx} = x^2 y + y$

23. Find expected value of the random Variable X whose

probability   mass   function   is

$X = x, 1, 2, 3 P(X = x)\dfrac{1}{5}, \dfrac{2}{5}, \dfrac{2}{5}$

24. If $y = x \log x$, then find $\dfrac{d^2 y}{dx^2}$

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25. State the converse, inverse and contrapositive of the conditional statement : 'If a sequence is bounded, then it is convergent'

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26. Show that :
$$\sin^{-1}\left(\frac{8}{17}\right) + \sin^{-1}\left(\frac{3}{5}\right) = \sin^{-1}\left(\frac{77}{85}\right)$$

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27. Show that the points A(2,1, -1), B(0, -1, 0), C(4, 0, 4) and D(2,0,1) are coplanar.

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28. If $\triangle ABC$ is right angled at B , where $A(5, 6, 4), B(4, 4, 1)$ and $C(8, 2, x)$, then find the value of x.

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29. Find the equation of the line passing through the point (3,1,2) and perpendicular to the lines $\dfrac{x-1}{1} = \dfrac{y-2}{2} = \dfrac{z-3}{3}$ and $\dfrac{x}{-3} = \dfrac{y}{2} = \dfrac{z}{5}$

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30. Find the distance of the point $\hat{i} + 2\hat{j} - \hat{k}$ from the plane $\overrightarrow{r} \cdot \left(\hat{i} - 2\hat{j} + 4\hat{k} \right) = 10$

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31. If $e^x + e^y = e^{x+y}$, show that $\dfrac{dy}{dx} = -e^{y-x}$

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32. The surface area of a spherical balloon is increasing at the rate of $2\dfrac{cm^2}{\text{sec}}$. At what rate the volume of the balloon is increasing when the radius of the balloon is 6 cm?

33. Find the apporximate value of e^{1005}: given $e = 2.7183$

34. Evaluate: $\int \dfrac{x^2 \tan^{-1} x^3}{1 + x^6} dx$

35. Solve the differential equation $\dfrac{dy}{dx} + y = e^{-x}$

36. If f(x)= kx, 0 lt x lt 2 = 0 otherwise, is a probability density function of a random variable X , then find (i) value of k, (ii) P(1 lt x lt2).

37. Show that a homogeneous equations of degree two in x and y , i.e., $ax^2 + 2hxy + by^2 = 0$ represents a pair of lines passing through the origin if $h^2 - 2ab \geq 0$.

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38. Solve the following linear programming problem:

Maximize : $z = 150x + 250y$ Subject to :

$4x + y \leq 40, 3x + 2y \leq 60, x \geq 0, y \leq 0$

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39. Solve the following equations by inverse method :

$$x + 3y + 3z = 12, \ x + 4y + 4z = 15, \ x + 3y + 4z = 13$$

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40. In triangle ABC, if a+b+c = 2s, then prove that

$$\sin\left(\frac{A}{2}\right) = \sqrt{\frac{(s-b)(s-c)}{bc}}$$ with usual notations

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41. Function f(x) is continuous on its domain

[-2,2],where f(x) = $\dfrac{\sin ax}{x}$ +2, for $-2 \leq x < 0$

$= 3x + 5$, for $0 \leq x \leq 1$

$=\sqrt{x^2+8} - b, f$ or `1 lt x le 2`

Find the value of a+b+2

42. prove that : $\int\sqrt{x^2+a^2}dx$ =

$\frac{x}{2}\sqrt{x^2+a^2} + \frac{a^2}{2}\log\left|x + \sqrt{x^2+a^2}\right|$+c

43. A fair coin is tossed 8 times. Find the probability

that :

(1) it shows no head

(2) it shows head at least once.

44. prove that : $\int_0^{2a} f(x)dx = \int_0^a f(x)dx + \int_0^a f(2a-x)dx$