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MATHS

BOOKS - GURUKUL BOOKS & PACKAGING MATHS (HINGLISH)

JULY 2018

Section I

1. If the sum of the slopes of the lines represented by $x^2 + kxy - 3y^2 = 0$ is twice their product, thent the vlaue of 'k' is

A. 2

B. 1

C. -1

D. -2

Answer: D

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2. If the vectors $\hat{i} - 2\hat{j} + \hat{k}, a\hat{i} - 5\hat{j} + 3\hat{k}$ and $5\hat{i} - 9\hat{j} + 4\hat{k}$ are coplanar, then the value of a is ....

A. 3

B. -3

C. 2

D. -2

Answer: C

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3. The acute angle between the line $\frac{x+1}{2}=\frac{y}{3}=\frac{z-3}{6}$ and the plane $10x+2y-11z=8$ is

A. $\sin^{-1}\left(\frac{8}{21}\right)$

B. $\cos^{-1}\left(\frac{8}{21}\right)$

C. $\sin^{-1}\left(\frac{1}{8}\right)$

D. $\cos^{-1}\left(\frac{1}{8}\right)$

Answer: A

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4. Wirte the dual of each of the following statements

:

(a) $\sim p \wedge (q \vee c)$

(b) Shweta is a doctor or Seema is a teacher.

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5. In any ΔABC, prove that

$$ac\cos B - bc\cos A = (a^2 - b^2)$$

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6. Show that the equation $2x^2 + xy - y^2 + x + 4y - 3 = 0$ represents a pair of lines.

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7. If $\vec{a}, \vec{b}, \vec{c}$ are the position vectors of the points A, B, C respectively such that $3\vec{a} + 5\vec{b} = 8\vec{c}$ then find the ratio in which C divides AB.

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8. If the points $A(-1, 3, 2), B(-4, 2, -2) and C(5, 5, \lambda)$ are collinear, find the value of λ .

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9. Show that $[(p \vee q) \vee r] \leftrightarrow [p \vee (q \vee r)]$ is a tautology

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10. Find the inverse of $\begin{pmatrix} 3 & 2 & 6 \\ 1 & 1 & 2 \\ 2 & 2 & 5 \end{pmatrix}$ by the adjoint method .

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11. If the angle between the lines represented by $ax^2 + 2hxy + by^2 = 0$ is equal to the angle between the lines $2x^2 - 5xy + 3y^2 = 0$, then show that $100(h^2 - ab) = (a + b)^2$.

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12. Prove that three vectors $\vec{a}, \vec{b}$ and $\vec{c}$ are coplanar if and only if there exists non-zero linear combination $x\vec{a} + y\vec{b} + z\vec{c} = \vec{0}$.

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13. Maximize z=6x+4y subject to constraints,

$x \leq 2, x + y \leq 3, \ - 2x + y \leq 1, xy \geq 0$

Also find the maximum value of 'z'.

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14. Find the general solution of the equation $\sin 2x + \sin 4x + \sin 6x = 0$.

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15. Write the following statements in symbolic form and write their negatins :

(1) Mangoes are delicious, but expensive.

(2) A person is rich if and only if he is a software engineer.

(3) If diagonals of a parallelogram are perpendicular, then it is a rhombus. solution :

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16. Express the following equations in matrix form and solve them by the method of reduction :

$x + y + z = 6, 3x - y + 3z = 6 \text{ and } 5x + 5y - 4z = 3$

.

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17. The vector equation of the line passing through the point (-1, -1 ,2) and parallel to the line 2x - 2= 3y +1 = 6z -2 is

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18. A plane meets the coordinate axes in A, B, C such that eh centroid of triangle ABC is the point (p, q, r). Show that the equation of the plane is $\frac{x}{p} + \frac{y}{q} + \frac{z}{r} = 3.$

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19. If α, β, γ are direction angles of a line l, then prove that

$\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1.$

Hence, deduce that $\sin^2\alpha + \sin^2\beta + \sin^2\gamma = 2.$

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20. Using the sine rule , prove the cosine rule.

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Section Ii

1. Equation of the tangent to the curve $2x^2 + 3y^2 - 5 = 0$ at (1, 1) is

A. $2x - 3y - 5 = 0$

B. $2x + 3y - 5 = 0$

C. $2x + 3y + 5 = 0$

D. $3x + 2y + 5 = 0$

Answer: B

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2. The order and degree of the differential equation $\left(\frac{d^3y}{dx^3}\right)^{\frac{1}{6}}-\left(\frac{dy}{dx}\right)^{\frac{1}{3}}=0$ are respectively .

A. 3, 2

B. 2, 3

C. 6, 3

D. 3, 1

Answer: D

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3. Given $X \sim B(n, p)$ if $p = 0.6$ $E(X) = 6$, then the value of Var (X) is

A. 2.4

B. 2.6

C. 2.5

D. 2.3

Answer: A

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4. The displacement s of a particle at a time t is given by $s = t^3 - 4t^2 - 5t.$ Find its velocity and acceleration at t = 2.

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5. If $y = \cos^{-1}(1 - 2\sin^2 x)$, find $\frac{dy}{dx}$

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6. Evaluate : $\int \frac{1}{\sin x . \cos^2 x} dx$

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7. Solve the following differential equation:

$$\frac{x^2 dy}{dx} = x^2 + xy + y^2$$

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8. Obtain the probobility distribution of the number of sixes in two tosses of a fair die.

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9. If $(x) = \frac{1 - \sqrt{3}\tan x}{\pi - 6x}$, $\text{for} x \neq \frac{\pi}{6}$ is continous at $x = \frac{\pi}{6}$, find $f\left(\frac{\pi}{6}\right)$.

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10. If $\sec^{-1}\left(\frac{x+y}{x-y}\right)=a^2$, show that $\frac{dy}{dx}=\frac{y}{x}$.

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

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12. A stone is dropped into a pand. Waves in the form of circles are generated and the radius of the outermost ripple increases at the rate of 2 inch/sec.

How fast will the area of the wave increase ?

(a) when the radius is 5 inch?

(b) after 5 seconds ?

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13. Evaluate: $\int_0^a \frac{dx}{x + \sqrt{(a^2 - x^2)}}$ or $\int_0^{\frac{\pi}{2}} \frac{dth\eta}{1 + \tan\theta}$

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14. The rate o growth of bacteria is proportional to the number present . IT intially, there were 1000 bacteria and the number doubles in 1 hours. Find the number of bacteria after $2\frac{1}{2}$ hours . [take $\sqrt{2} = 1.414$]

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15. Discuss the continous of the following function on its domain, where

$f(x) = x^2 - 4, \text{for} 0 \leq x \leq 2$

$= 2x + 3, \text{for} 2 < x \leq 4$

$= x^2 - 05, \text{for} 4 < x \leq 6.$

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16. If y =f(u) is differentiable function of u, and u=g(x) is a differentiable function of x, then prove that y= f [g(x)] is a differentiable function of x and $\frac{dy}{dx} = \frac{dy}{du} \times \frac{du}{dx}$.

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17. Supose that 80 % of all families own a elevision set. If 10 families are interviewed at random, find the probability that seven famileis own a television set .

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18. If u and v are integrable function of x, then, show that $\int u.\,v.\,dx = u\int v dx - \int\left[\frac{du}{dx}\int v dx\right]dx.$ Hence evaluate $\int \log x dx.$

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19. Property 6: If f(x) is a continuous function defined on $[0;\,2a]$ then

$$\int_0^2 a = \int_0^a f(x)dx + \int_0^a f(2a - x)dx$$

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20. Find k if the function f(x) is defined by

$f(x) = kx(1-x)$, for $0 < x < 1$

=0 , otherwise, is the probability density function (p.d.f.) of a random varible (r.v) X. Also find P $\left(X < \frac{1}{2}\right)$

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