MATHS

BOOKS - FULL MARKS MATHS (TAMIL ENGLISH)

EXAMINATION QUESTION PAPER - JUNE 2019

Part I

1. The range of the function $\frac{1}{1-2\sin x}$ is .....

A. $(-\infty, -1) \cup \left(\frac{1}{3}, \infty\right)$

B. $\left(-1, \frac{1}{3}\right)$

C. $\left[-1, \frac{1}{3}\right]$

D. $(-\infty, -1] \cup \left[\frac{1}{3}, \infty\right)$

Answer:

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2. If the function $f: [-3, 3] \rightarrow S$ defined by $f(x) = x^2$ is onto, then S is .....

A. [-9,9]

B. R

C. [-3,3]

D. [0,9]

Answer:

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3. The number of solutions of $x^2 + |x + 1| = 1$ i s .....

A. 1

B. 0

C. 2

D. 3

Answer:

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4. $\cos 1^\circ + \cos 2^\circ + \cos 3^\circ + \ldots + \cos 179^\circ$ =

.....

A. 0

B. 1

C. -1

D. 89

Answer:

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5. If $\tan\alpha$ and $\tan\beta$ are the roots of $x^2 + ax + b = 0$, where $a \neq 0$ then $\sin(\alpha + \beta)\sec\alpha\sec\beta$ is equal to .....

A. b

B. a

C. $-a$

D. $-b$

Answer:

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6. The number of sides of a polygon having 27 diagonals is .....

A. 9

B. 6!

C. 11

D. 22

Answer:

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7. The H.M. of two positive numbers whose A.M. and G.M. are 16, 8 respectively is .....

A. 10

B. 6

C. 5

D. 4

Answer:

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8. The n^{th} term of the sequence $\frac{1}{2}, \frac{3}{4}, \frac{7}{8}, \frac{15}{16} is$

.....

A. $2^n - n - 1$

B. $1 - 2^{-n}$

C. $2^{-n} + n - 1$

D. 2^{n-1}

Answer:

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9. The intercepts of the perpendicular bisector of the line segment joining (1,2) and (3, 4) with coordinate axes are ..... .

A. $5, -5$

B. 5, 5

C. 5, 3

D. $5, -4$

Answer:

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10. The image of the point (2, 3) in the line y = $-x$ is

.....

A. $(-3, -2)$

B. $(-3, 2)$

C. $(-2, -3)$

D. $(3, 2)$

Answer:

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11. If $A = \begin{bmatrix} \lambda & 1 \\ -1 & -\lambda \end{bmatrix}$, then for what values of λ, $A^2 = 0$? .....

A. 0

B. ± 1

C. -1

D. 1

Answer:

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12. if $\vec{a}$ and $\vec{b}$ are having same magnitude and angle between them is 60° and their scalar product is $\frac{1}{2}$, then $\left|\vec{a}\right|$ is .....

A. 2

B. 3

C. 7

D. 1

Answer:

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13. $\lim_{x \to \infty} \frac{a^x - b^x}{x}$ = ...

A. log ab

B. $\log\left(\frac{a}{b}\right)$

C. $\log\left(\frac{b}{a}\right)$

D. a/b

Answer:

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14. The derivative of f (x) = x |x| at x = -3 i s .....

A. 6

B. -6

C. does not exist

D. 0

Answer:

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15. If f(x) = $x^2 - 3x$, then the points at whichf(x) = f '(x) are .....

A. both positive integers

B. both negative integers

C. both irrational

D. one rational and another irrational

Answer:

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16. $\int \tan^{-1} \sqrt{\frac{1-\cos 2x}{1+\cos 2x}} dx$ is

A. $x^2 + c$

B. $2x^2 + c$

C. $\frac{x^2}{2} + c$

D. $-\frac{x^2}{2}+c$

Answer:

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17. $\int e^{-7x}\sin 5x dx$ is .....

A. $\frac{e^{-7x}}{74}[-7\sin 5x-5\cos 5x]+c$

B. $\frac{e^{-7x}}{74}[7\sin 5x+5\cos 5x]+c$

C. $\frac{e^{-7x}}{74}[7\sin 5x-5\cos 5x]+c$

D. $\frac{e^{-7x}}{74}[-7\sin 5x+5\cos 5x]+c$

Answer:

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18. If A and B are any two events then the probability that exactly one of them occur is .....

A. $P(A \cup \overline{B}) + P(\overline{A} \cup B)$

B. $P(A \cap \overline{B}) + P(\overline{A} \cap B)$

C. $P(A) + P(B) - P(A \cap B)$

D. $P(A) + P(B) + 2P(A \cap B)$

Answer:

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19. In a certain college 4% of the boys and 1% of the girls are taller than 1.8 meter. Further 60% of the students are girls. If a student is selected at random and is taller than 1.8 meters, then the probability that the student is a girl is

A. $\frac{2}{11}$

B. $\frac{3}{11}$

C. $\frac{5}{11}$

D. $\frac{7}{11}$

Answer:

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20. Resolve $\frac{3x+1}{(x-2)(x+1)}$ into partial fractions.

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Part Ii

1. Prove that $\frac{\cot(180^\circ+\theta)\sin(90^\circ-\theta)\cos(-\theta)}{\sin(270^\circ+\theta)\tan(-\theta)\operatorname{cosec}(360^\circ+\theta)} = \cos^2\theta\cot\theta$

.

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2. If Q is a point on the locus of $x^2 + y^2 + 4x - 3y + 7 = 0$, then find the equation of locus of P which divides segment OQ externally in the ratio 3:4, where O is the origin.

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3. If the letters of the word IITJEE are permuted in all possible ways and the strings thus formed are arranged in the lexicographic order, find the rank of the word IITJEE.

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4. Prove that $\frac{(2n)!}{n!} = 2^n(1, 3, 5, \ldots\ldots\ldots (2n-1))$.

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5. Write the equation of the line passing through the point (1,-1) and parallel to the line $x + 3y - 4 = 0$

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6. If (A, 2), (2,4) and (3, 2) are vertices of the triangle of area 4 square units then determine the value of A.

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7. Find λ, when the projection of $\vec{a} = \lambda\hat{i} + \hat{j} + 4\hat{k}$ on $\vec{b} = 2\hat{i} + 6\hat{j} + 3\hat{k}$, is 8 units.

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8. Find $\frac{dy}{dx}$ if $y = e^x \sin 2x$

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9. Find $\frac{dy}{dx}$ if $x^3 + y^3 = 1$.

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Part Iii

1. From the curves y = sin x, draw y = sin |x|

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2. If one root of $k(x-1)^2 = 5x - 7$ is double the other root, show that k=2 or -25.

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3. If $\theta + \phi = \alpha$ and $\tan\theta = k\tan\phi$, then prove that $\sin(\theta - \phi) = \frac{k-1}{k+1}\sin\alpha$.

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4. If a,b,c are in geometric progression, and if $a^{\frac{1}{x}} = b^{\frac{1}{y}} = c^{\frac{1}{z}}$, then prove that x, y, z arithmetic progression.

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5. Show that the points (1, 3), (2, 1) and $\left(\frac{1}{2}, 4\right)$ are collinear, by using

any other method.

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6. If A and B are symmetric matrices of same order, prove that AB + BA is a symmetric matrix.

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7. If $A \times A$ has 16 elements, $S = \{(a, b) \in A \times A, a < b\} : (-1, 2)$ and (0,1) are two elements of S, then find the remaining elements of S.

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8. Evaluate $\lim_{x \to 0} \frac{\sqrt{1 + x^2} - 1}{x}$

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9. Find the derivaties of the following functions

$y = x^{\cos x}$

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10. Evaluate

$$\int \left(\frac{12}{(4x-5)^3} + \frac{6}{3x+2} + 16e^{4x+3} \right) dx$$

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Part Iv

1. (a) Let f,g : $R \to R$ be defined as f(x) $= 2x - |x|$ and g(x) $= 2x + |x|$. Find fog.

(b) Prove that $\lim_{\theta \to 0} \frac{\sin\theta}{\theta} = 1$

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2. Evaluate $\int \frac{3x+5}{x^2+4x+7} dx$

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3. Find $\sqrt[3]{65}$ using binomial expansion upto two decimal places.

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4. Prove that :

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$$

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5. Show that the points whose position vectors $4\hat{i}+5\hat{j}+\hat{k}, -\hat{j}-\hat{k}, 3\hat{i}+9\hat{j}+4\hat{k}$ and $-4\hat{i}+4\hat{j}+4\hat{k}$ are coplanar.

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6. A consulting firm rents car from three agencies such that 50% from agency L, 30% from agency M and 20% from agency N. If 90% of the cars from L, 70% of cars from M and 60% of cars from N are in good conditions (i) what is the probability that the firm will get a car in good condition? (ii) if a car is in good condition, what is probability that it has come from agency N?

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7. If $y = \left(\cos^{-1} x\right)^2$ prove that $\left(1 - x^2\right)\frac{d^2y}{dx^2} - x\frac{dy}{dx} - 2 = 0$. Hence find y_2 when

x=0.

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