MATHEMATICS

1) $\int e^{\sqrt{x}}dx = \_\_\_\_\_ + C ; x > 0$

(A) $\left(1-\sqrt{x}\right)e^{\sqrt{x}}$

(B) $2\left(1-\sqrt{x}\right)e^{\sqrt{x}}$

(C) $2\left(\sqrt{x}-1\right)e^{\sqrt{x}}$

(D) $\left(\sqrt{x}-1\right)e^{\sqrt{x}}$

2) If $\int \frac{\sin x}{\sin(x-\alpha)}dx = px - q\log\left|\sin(x-\alpha)\right| + C$, then $pq =$ _____.

(A) $\sin 2\alpha$

(B) $\frac{1}{2}\sin 2\alpha$

(C) $-\frac{1}{2}\sin 2\alpha$

(D) $-\sin 2\alpha$

3) $\int_1^3 \left(\frac{x^2+1}{4x}\right)^{-1} dx =$ _____.

(A) $\frac{1}{2}\log 5$

(B) $\log 25$

(C) $\log 5$

(D) $\log 100$

(Space for Rough Work)

4) If $\int_{1}^{K}(2x-3)=12$, then K = _____.

(A) 5 (B) 2

(C) –2 and 5 (D) –5

5) $\int_{-\pi/2}^{\pi/2}\frac{\cos^2 2x}{1+25^x}dx=$ _____.

(A) $-\frac{\pi}{2}$ (B) $\frac{\pi}{2}$

(C) $\frac{\pi}{4}$ (D) $-\frac{\pi}{4}$

6) The area bounded by curve $y=\sin 2x$ ($x=0$ to $x=\pi$) and X-axis is _____.

(A) 2 (B) 1

(C) 4 (D) $\frac{3}{2}$

7) Area bounded by the ellipse $2x^2+3y^2=1$ is _____.

(A) $\frac{\pi}{\sqrt{6}}$ (B) 6π

(C) $\frac{\pi}{6}$ (D) $\sqrt{6}\pi$

8) The integrating factor (I.F.) of differential equation $\frac{dy}{dx}(1+x)-xy=1-x$ is _____.

(A) $(x-1)e^{-x}$ (B) $(1+x)e^{-x}$

(C) $(1+x)e^{x}$ (D) $(1-x)e^{-x}$

9) If the general solution of some differential equation is $y=a_1(a_2+a_3)\cdot\cos(x+a_4)-a_5\,e^{x+a_6}$ then order of differential equation is _____.

(A) 5 (B) 4

(C) 6 (D) 3

10) If the length of the subnormal at any point of the curve is constant, then the eccentricity of this curve is _____.

(A) $e>1$ (B) $0<e<1$

(C) $e=\sqrt{2}$ (D) $e=1$

11) If $|\bar{x}|=|\bar{y}|=|\bar{x}+\bar{y}|=1$, then $|\bar{x}-\bar{y}|=$_____

(A) $\sqrt{3}$ (B) 1

(C) $\sqrt{2}$ (D) 3

12) If $\bar{x}$ is a vector in the direction of $(2,-2,1)$ of magnitude 6 and $\bar{y}$ is a vector in the direction of $(1,1,-1)$ of magnitude $\sqrt{3}$, then $|\bar{x}+2\bar{y}|=$ _____.

(A) $\sqrt{35}$ (B) $\sqrt{17}$

(C) 40 (D) $2\sqrt{10}$

(Space for Rough Work)

13) The angle between two adjacent sides $\bar{a}$ and $\bar{b}$ of parallelogram is $\frac{\pi}{6}$. If $\bar{a}=(2,-2,1)$ and $|\bar{b}|=2|\bar{a}|$, then area of this parallelogram is _____.

(A) 18

(B) $\frac{9}{2}$

(C) 9

(D) $\frac{3}{4}$

14) The perpendicular distance from the point of intersection of line $\frac{x+1}{2}=\frac{y+2}{3}=\frac{z}{-1}$ and plane $2x-y+z=0$ to the Z-axis is _____.

(A) $\sqrt{5}$

(B) 2

(C) 1

(D) 5

15) The measure of the angle between the line $\bar{r}=(2,-3,1)+k(2,2,1)\,;\ k\in\mathbb{R}$ and the plane $2x-2y+z+7=0$ is _____.

(A) $\tan^{-1}\frac{1}{4\sqrt{5}}$

(B) $\sin^{-1}\frac{1}{3}$

(C) $\cos^{-1}\frac{1}{9}$

(D) $\pi/2$

16) The image of the point A(1, 2, 3) relative to the plane π is B(3, 6, –1), the equation of plane π is _____.

(A) $x + 2y - 2z + 8 = 0$

(B) $x - 2y + 2z - 8 = 0$

(C) $x + 2y + 3z - 1 = 0$

(D) $x + 2y - 2z - 8 = 0$

17) $f: R \to R$, $f(x) = x^2 + 3x + 4$ is _____

(A) one-one and not onto

(B) many-one and not onto

(C) one-one and onto

(D) not one-one and onto

18) If $a * b = \frac{ab}{10}$; $a, b \in Q^+$, then $(5*8)^{-1}$ = _____.

(A) $\frac{1}{25}$

(B) 10

(C) 4

(D) 25

19) If $f: N \to N$, $f(x) = x + 3$, then $f^{-1}(x) =$ _____

(A) does not exists

(B) $x - 3$

(C) $x + 3$

(D) $3 - x$

20) $\sin^2\left(\sin^{-1}\frac{1}{2}\right) + \tan^2\left(\sec^{-1}2\right) + \cot^2\left(\operatorname{cosec}^{-1}4\right) =$

(A) $\frac{37}{2}$

(B) $\frac{89}{4}$

(C) $\frac{73}{4}$

(D) 19

21) $\tan\left(\cos^{-1}\frac{4}{5} + \tan^{-1}\frac{2}{3}\right) =$ _____.

(A) $\frac{17}{6}$

(B) $\frac{17}{4}$

(C) $\frac{3}{17}$

(D) $\frac{6}{17}$

(Space for Rough Work)

22) $\cos\left(\cot^{-1}\left(\operatorname{cosec}\left(\cos^{-1} a\right)\right)\right)=$ _____ (where, $0 < a < 1$)

(A) $\sqrt{3-a^2}$

(B) $\sqrt{2-a^2}$

(C) $\frac{1}{\sqrt{2-a^2}}$

(D) $\frac{1}{\sqrt{2+a^2}}$

23) $\begin{vmatrix} \sin^2\theta & \cos^2\theta \\ -\cos^2\theta & \sin^2\theta \end{vmatrix} =$ _____.

(A) $\frac{1}{2}\left(1+\cos^2 2\theta\right)$

(B) $\frac{1}{2}\left(1-\sin^2 2\theta\right)$

(C) $\cos 2\theta$

(D) $\frac{1}{2}\sin^2 2\theta$

24) If $\begin{vmatrix} 1! & 2! & 3! \\ 2! & 3! & 4! \\ 3! & 4! & 5! \end{vmatrix} = 2016K$, then $K =$ _____.

(A) 84

(B) $\frac{1}{24}$

(C) 24

(D) $\frac{1}{84}$

25) If $\begin{vmatrix} 1+x & 1 & 1 \\ 1+y & 1+2y & 1 \\ 1+z & 1+z & 1+3z \end{vmatrix} = 10K\,xyz\left(3+\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$, then K = _____.

$\left(\text{Where } xyz \neq 0; 3+\frac{1}{x}+\frac{1}{y}+\frac{1}{z} \neq 0\right)$.

(A) 2 (B) 5

(C) $\frac{1}{5}$ (D) 1

26) If the inverse of the matrix $A=\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ is $\frac{1}{5}\begin{bmatrix} -3 & 2 & 2 \\ 2 & -3 & \alpha \\ 2 & 2 & -3 \end{bmatrix}$ then,

α= _____.

(A) 4 (B) 2

(C) 3 (D) –2

27) Matrix $A_r=\begin{bmatrix} r & r-1 \\ r-1 & r \end{bmatrix}$; r = 1, 2, 3,..... If $\sum_{r=1}^{100}|A_r|=\left(\sqrt{10}\right)^K$, then

K = _____; $\left(|A_r|=\det(A_r)\right)$.

(A) 6 (B) 4

(C) 2 (D) 8

28) $\frac{d}{dx}\left(3\cos\left(\pi/6+x^\circ\right)-4\cos^3\left(\pi/6+x^\circ\right)\right)=$ _____.

(A) $\frac{\pi}{60}\sin\left(3x^\circ\right)$

(B) $\pi/60\cos\left(3x^\circ\right)$

(C) $\cos(3x^\circ)$

(D) $-\pi/60\sin\left(3x^\circ\right)$

29) If $f(x)=1+x+x^2+\ldots\ldots+x^{1000}$, then $f'(-1)=$ _____.

(A) -500 (B) -100

(C) -50 (D) 500500

30) Applying mean value theorem on $f(x)=\log x$; $x\in[1, e]$ the value of $c=$ _____.

(A) $e-1$ (B) $1-e$

(C) $\log(e-1)$ (D) 2

31) If $\int \sin^{13}x\cos^3 x\,dx=A\sin^{14}x+B\sin^{16}x+C$, then $A+B=$ _____

(A) $\frac{17}{112}$ (B) $\frac{15}{112}$

(C) $\frac{1}{110}$ (D) $\frac{1}{112}$

32) If $\int \frac{1+\cos x}{\cos x-\cos^2 x}dx = \log|\sec x+\tan x| - 2f'(x)+C$, then $f(x) =$ _____.

(A) $2\log\left|\sin\frac{x}{2}\right|$

(B) $-2\cot\left(\frac{x}{2}\right)$

(C) $2\cot\left(\frac{x}{2}\right)$

(D) $-2\log\left|\sin\frac{x}{2}\right|$

33) The probability that an event A occurs in a single trial of an experiment is 0.6. In the first three independent trials of the experiment, the probability that A occurs atleast once is _____.

(A) 0.936

(B) 0.925

(C) 0.930

(D) 0.927

34) If $6P(A) = 8P(B) = 14P(A \cap B) = 1$, then $P\left(A'/_B\right) =$ _____

(A) $4/7$

(B) $3/5$

(C) $3/7$

(D) $2/5$

35) The mean and variance of a random variable X having a binomial distribution are 6 and 3 respectively. The probability of variable X less than 2 is _____.

(A) $\frac{13}{4096}$

(B) $\frac{15}{4096}$

(C) $\frac{13}{2048}$

(D) $\frac{25}{2048}$

36) The coordinates of the corner points of the bounded feasible region are (10, 0), (2, 4), (1, 5) and (0, 8). The maximum of objective function $z = 60x + 10y$ is _____.

(A) 800

(B) 600

(C) 700

(D) 110

37) If the rate of change of area of rhombus with respect to it's side is equal to the side of rhombus, then the angles of rhombus are _____.

(A) $\frac{\pi}{4}$ and $\frac{3\pi}{4}$

(B) $\frac{\pi}{6}$ and $\frac{5\pi}{6}$

(C) $\frac{\pi}{3}$ and $\frac{2\pi}{3}$

(D) $\frac{5\pi}{12}$ and $\frac{7\pi}{12}$

38) The approximate value of $5^{2.01}$ is _____, where, $(\log_e 5 = 1.6095)$

(A) 25.2525 (B) 25.5025

(C) 25.4125 (D) 25.4024

39) $f(x)=\frac{x}{\log_x e}$ is increasing on the interval _____; where $x \in R^+ - \{1\}$.

(A) $\left(\frac{1}{e}, 1\right) \cup (1, \infty)$

(B) $(0, \infty) - \{1\}$

(C) $(-e, \infty)$

(D) $\left(\frac{1}{e}, \infty\right)$

40) $\int (2+\log x)(ex)^x \, dx = $ _____ $+ C ; x > 1.$

(A) x^x (B) $(ex)^{-x}$

(C) $(ex)^x$ (D) e^{x^x}