Top 200+ Maths Questions for NDA 2020 Exam

1.Which one of the following is the second degree polynomial function f(x) where f(0) = 5, f(-1) = 10 and f(1) = 6?

A. $5x^2 - 2x + 5$
B. $3x^2 - 2x - 5$
C. $3x^2 - 2x + 5$
D. $3x^2 - 10 + 5$

###COMMON###2###4###**Directions for the following three (03) items:**

Read the following information and answer the three items that follow:

A curve $y = me^{mx}$ where m > 0 intersects y-axis at a point P.

###DONE###

2.

What is the slope of the curve at the point of intersection P?

A. m
B. m^2
C. 2m
D. $2m^2$

3.How much angle does the tangent at P make with y-axis?

A. $\tan^{-1} m^2$
B. $\cot^{-1}(1 + m^2)$
C. $\sin^{-1}\left(\frac{m^2}{\sqrt{1+m^4}}\right)$
D. $\sec^{-1}\sqrt{1+m^4}$

4.What is the equation of tangent to the curve at P?

A. y = mx + m
B. y = -mx + 2m
C. $y = m^2x + 2m$
D. $y = m^2x + m$

###COMMON###5###6###**Directions for the following two (02) items:**

Read the following information and answer the two items that follow:

Let f(x) = x^2, g(x) = tanx and h(x) = ln x.

###DONE###

5.

For $x = \frac{\sqrt{\pi}}{2}$, what is the value of [ho(gof)](x)?

A. 0
B. 1
C. $\frac{\pi}{4}$
D. $\frac{\pi}{2}$

6.What is [fo(fof)](2) equal to?

A. 2
B. 8
C. 16
D. 256

7.The value of $\frac{\log_a n}{\log_{ab} n}$

A. $1+\log_a b$
B. $1+\log_b a$
C. 1
D. 0

8.If $\log_{0.5}\sin x = 1 - \log_{0.5}\cos x$, then the number of solutions in the interval $[-2\pi, 2\pi]$ is

A. 1
B. 3
C. 2

D. 4

9.Let u = $(\log_2 x)^2 - 6\log_2 x + 12$, where x is a real number. Then , the given equation $x^u = 256$.

A. No solution for x
B. Exactly one solution for x
C. Exactly two distinct solution for x
D. Exactly three distinct solution for x

10.If $log_{\left(\frac{3}{10}\right)}(y-1) < log_{\frac{9}{100}}(y-1)$, then y lies in the interval-

A. $y \in (2, \infty)$
B. $y \in [3, \infty)$
C. $y \in [2, \infty)$
D. $y \in R$

11.convert 101101 form binary to decimal

A. 45
B. 56
C. 61
D. 72

12.Add the following unsigned binary numbers 10010 and 1110.

A. 100110
B. 100001
C. 100000
D. 100011

13.Multiply the following unsigned binary numbers : 110 and 11.

A. 10011
B. 10010
C. 11110
D. 10110

14.If $\tan(\cot x) = \cot(\tan x)$, then

A. $\sin 2x = \frac{2}{(2n+1)\pi}$, $n \in Z$

B. $\sin 2x = \frac{4}{(2n+1)\pi}$, $n \in Z$

C. $\sin 2x = \frac{4}{(2n+1)\pi}$, $n \in Z$

D. none of these

15.The solution of the equation

$(\sin x + \cos x)^{1+\sin 2x} = 2$, $-\pi \le x \le \pi$, is

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

B. π

C. $\frac{\pi}{4}$

D. none of these

16.The equation $4\sin^{-1} x + \cos^{-1} x = \pi$, then x equal to:

A. 0

B. $\frac{1}{2}$

C. $\frac{\sqrt{3}}{2}$

D. $\frac{1}{\sqrt{2}}$

17.What is the length of the chord of a unit circle which subtends an angle θ at the centre?

A. $\sin\left(\frac{\theta}{2}\right)$

B. $\cos\left(\frac{\theta}{2}\right)$

C. $2\sin\left(\frac{\theta}{2}\right)$

D. $2\cos\left(\frac{\theta}{2}\right)$

18.A moving boat is observed from the top of a cliff of 150 m height. The angle of depression of the boat changes from 60o to 45o in 2 minutes. What is the speed of the boat in metres per hour?

A. $\frac{4500}{\sqrt{3}}$

B. $\frac{4500(\sqrt{3}-1)}{\sqrt{3}}$

C. $4500\sqrt{3}$

D. $\frac{4500(\sqrt{3}+1)}{\sqrt{3}}$

19.The top of a hill when observed from the top and bottom of a building of height h is at angles of elevation p and q respectively. What is the height of the hill?

A. $\frac{h \cot q}{\cot q - \cot p}$

B. $\frac{h \cot p}{\cot p - \cot q}$

C. $\frac{2h \tan p}{\tan p - \tan q}$

D. $\frac{2h \tan q}{\tan q - \tan p}$

20.The angles of elevation of the top of a tower from the top and foot of a pole are respectively 30º and 45º. If h_T is the height of the tower and h_P is the height of the pole, then which of the following are correct?

1) $\frac{2h_P h_T}{3+\sqrt{3}} = h_P^2$

2) $\frac{h_T - h_P}{\sqrt{3}+1} = \frac{h_P}{2}$

3) $\frac{2(h_P + h_T)}{h_P} = 4 + \sqrt{3}$

Select the correct answer using the code given below.

A. 1 and 3 only
B. 2 and 3 only
C. 1 and 2 only
D. 1, 2 and 3

21.A lamp post stands on a horizontal plane. From a point situated at a distance 150 m from its foot, the angle of elevation of the top is 30°. What is the height of the lamp post?

A. 50 m
B. $50\sqrt{3}$ m
C. $\frac{50}{\sqrt{3}}$ m
D. 100 m

22.What is the measure of the angle $75^{\circ}35'30''$ in radian ?

A. 2 radians
B. 3.2 radians
C. 1.3 radians
D. 1.9 radians

23.What is cot A + cosec A equal to ?

A. $\tan\left(\frac{A}{2}\right)$
B. $\cot\left(\frac{A}{2}\right)$
C. $2\tan\left(\frac{A}{2}\right)$
D. $2\cot\left(\frac{A}{2}\right)$

24.the value of cot(cosec$^{-1}\frac{5}{3}$ + tan$^{-1}\frac{2}{3}$) is

A. $\frac{3}{17}$
B. $\frac{5}{17}$

C. $\frac{4}{17}$
D. $\frac{6}{17}$

25.if $3\cot\theta = 2$ find the value of $\frac{3\sin\theta - 3\cos\theta}{2\sin\theta + 6\cos\theta}$

A. 1
B. 0.167
C. 0.25
D. 2

26.If $x^2 + x + 1$ is a factor of $ax^3 + bx^2 + cx + d$, then the real roots of $ax^3 + bx^2 + cx + d = 0$ is

A. $\frac{d}{a}$
B. $-\frac{d}{a}$
C. $-\frac{b}{a}$
D. $-\frac{c}{a}$

27.If 6 lies between the roots of the equation $x^2 + 2(a-3)x + 9 = 0$, then

A. $a \in [-3/4, \infty)$
B. $a \in (\infty, -3/4)$
C. $a \in (-\infty, 0) \cup (6, \infty)$
D. $a \in (-3/4, 6)$

28.If $1, \omega, \omega^2$ is the cube roots of unity, then the value of $(1+\omega)^3 - (1+\omega^2)^3$ is :

A. 2ω
B. 2
C. -2

D. 0

29.For any complex number z the minimum value of $|z|+|z-1|$ is

A. 1
B. 0
C. $\frac{1}{2}$
D. $\frac{3}{2}$

30.If α and β are the roots of the equation $x^2-3x+2=0$, then the value of $\begin{vmatrix} 0 & \alpha & \beta \\ 1 & -\alpha & \alpha \\ \beta & 0 & 0 \end{vmatrix}$ is:

A. 6
B. -6
C. $\frac{3}{2}$
D. 3

31.If $f(x)=\begin{vmatrix} x+\lambda & x & x \\ x & x+\lambda & x \\ x & x & x+\lambda \end{vmatrix}$, then $f(3x)-f(x)=$

A. $3x\lambda^2$
B. $6x\lambda^2$
C. $x\lambda^2$
D. none of these

32.If $A=\begin{bmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$, then $\det(adj(adjA))$, is

A. 14^4
B. 14^3

C. 14^2
D. 14

33.Find the matrix X such that $2A+B+X=O$,
where $A=\begin{bmatrix}-1 & 2\\ 3 & 4\end{bmatrix}$ and $B=\begin{bmatrix}3 & -2\\ 1 & 5\end{bmatrix}$. here O means zero matrix

A. $\begin{bmatrix}1 & -2\\ -7 & 13\end{bmatrix}$
B. $\begin{bmatrix}1 & 2\\ 5 & 13\end{bmatrix}$
C. $\begin{bmatrix}-1 & -2\\ -7 & -13\end{bmatrix}$
D. none of these

34.If $a>b>c$ and the system of equations $ax+by+cz=0,\ bx+cy+az=0$ and $cx+ay+bz=0$ has a non-trivial solution, then the quadratic equation $ax^2+bx+c=0$ has

A. at least one positive root
B. roots opposite in sign
C. positive roots
D. imaginary roots

35.If the system of equations $x-ky-z=0$, $kx-y-z=0$ and $x+y-z=0$ has a non-zero solution, then the possible values of k are

A. $-1, 2$
B. $1, 2$
C. $0, 1$
D. $-1, 1$

36.If $\omega(\neq 1)$ is a cube root of unity, then $\begin{vmatrix}1 & 1+i+\omega^2 & \omega^2\\ 1-i & -1 & \omega^2-1\\ -i & -i+\omega-1 & -1\end{vmatrix}$ equals:

A. 0
B. 1
C. I
D. ω

37.The system of linear equations $x+y+z=2$, $2x+y-z=3$ and $3x+2y+kz=4$ has a unique solution if:

A. $k \neq 0$
B. $-1 < k < 1$
C. $-2 < k < 2$
D. $k = 0$

38.A teacher takes 3 children from her class to the zoo at a time as often as she can, but she doesn't take the same set of three children more than once. She finds out that she goes to the zoo 84 times more than a child goes to the zoo, Total number of students in her class in equal to :

A. 15
B. 12
C. 10
D. 25

39.A regular polygon has 20 sides. How many triangles can be formed such that two vertices of the triangle must be the adjacent vertices of the triangle.

A. 340
B. 280
C. 440
D. 380

40.Suppose a, b, c are in AP and a^2, b^2, c^2 are in GP. If a < b < c & $a+b+c=\frac{3}{2}$, then the value of a is

A. $\frac{1}{2}-\frac{1}{\sqrt{2}}$
B. $\frac{1}{2}+\frac{1}{\sqrt{2}}$

C. $\frac{3}{2}-\frac{1}{\sqrt{2}}$
D. $\frac{1}{2}-\frac{3}{\sqrt{2}}$

41.In how many ways 7 men and 7 women can sit on a round table such that no ways women sit together is:

A. $(7!)^2$
B. $7!\times 6!$
C. $(6!)^2$
D. $13!-7!$

42.If ${}^nC_{12}={}^nC_8$ then n is equal to:

A. 20
B. 12
C. 6
D. 30

43.The number of signals that can be sent by 6 flags of different colours taking one or more at a time is given by :

A. 1856
B. 1956
C. 1736
D. None of these

44.Ten different letter of a alphabet is given. Words with 5 letter is formed from these given letters. Then the number words which have at least one letter repeated is :

A. 69,760
B. 30,240
C. 99,784
D. None of these

45.The sum of all numbers greater than 10000 formed by using digits $0, 2, 4, 6, 8,$ no digits being repeated in any number, is

A. $\frac{20}{9}\left(10^5-10^4\right)$
B. $\frac{40}{3}\left\{4\left(10^5-1\right)-\left(10^4-1\right)\right\}$
C. $\frac{20}{9}\left\{4\left(10^5-1\right)-\left(10^4-1\right)\right\}$
D. $20\times 4!\left(\frac{10^5-1}{10-1}\right)$

46.A machine has three parts, A, B and C, whose chances of being defective are 0.02, 0.10 and 0.05 respectively. The machine stops working if any one of the parts becomes defective. What is the probability that the machine will not stop working?

A. 0.06
B. 0.16
C. 0.84
D. 0.94

47.Three independent events, A_1, A_2 and A_3 occur with probabilities $P(A_i)=\frac{1}{1+i}$, $i=1,2,3$. What is the probability that at least one of the three events occurs?

A. $\frac{1}{4}$
B. $\frac{2}{3}$
C. $\frac{3}{4}$
D. $\frac{1}{24}$

48.A bag contains 4 white and 2 black balls and another bag contains 3 white and 5 black balls. If one ball is drawn from each bag, then the probability that one ball is white and one ball is black is

A. $\frac{5}{24}$
B. $\frac{13}{24}$

C. $\frac{1}{4}$

D. $\frac{2}{3}$

49.An insurance company insured 2000 scooter drivers, 4000 car drivers and 6000 truck drivers. The probabilities of an accident involving a scooter driver, car driver and a truck driver are 0.01, 0.03 and 0.15 respectively. One of the insured persons meets with an accident. The probability that the person is a scooter driver is

A. 1

B. 3

C. 15

D. 19

50.The regression coefficients of a bivariate distributions are -0.64 and -0.36. Then the correlation coefficient of the distribution is

A. 0.48
B. -0.48
C. 0.50
D. -0.50

###COMMON###51###54###**For the next four (04) items that follow :**

Consider events A, B, C, D, E of the sample space S = {n: n is an integer such that 10 ≤ n ≤ 20} given by :

A is the set of all even numbers.

B is the set of all prime numbers.

C = (15).

D is the set of all integers ≤ 16.

E is the set of all double digit numbers expressible as a power of 2

###DONE###

51.

A, B and D are

A. Mutually exclusive events but not exhaustive events
B. Exhaustive events but not mutually exclusive events
C. Mutually exclusive and exhaustive events
D. Elementary events

52.A, B and C are

A. Mutually exclusive events but not exhaustive events
B. Exhaustive events but not mutually exclusive events
C. Mutually exclusive and exhaustive events
D. Elementary events

53.B and C are

A. Mutually exclusive events but not exhaustive events
B. Compound events
C. Mutually exclusive and exhaustive events
D. Elementary events

54.C and E are

A. Mutually exclusive events but not elementary events
B. Exhaustive events but not mutually exclusive events
C. Mutually exclusive and exhaustive events
D. Elementary and mutually exclusive Events

55.Let the sample space consist of non-negative integers up to 50, X denote the numbers which are multiples of 3 and y denote the odd numbers. Which of the following is/are correct?

1) $P(x) = \frac{8}{25}$

2) $P(Y) = \frac{1}{2}$

Select the correct answer using the code given below.

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

56.Let A and B be two events with $P(A)=\frac{1}{3}, P(B)=\frac{1}{6}$ and $P(A\cap B)=\frac{1}{12}$. what is $P(B|\bar{A})$ equal to?

A. $\frac{1}{5}$
B. $\frac{1}{7}$
C. $\frac{1}{8}$
D. $\frac{1}{10}$

57.What is the probability that at least two persons out of a group of three persons were born in the same month (disregard year)?

A. $\frac{33}{144}$
B. $\frac{17}{72}$
C. $\frac{1}{144}$
D. $\frac{2}{9}$

58.If $P(B)=\frac{3}{4}, P(A\cap B\cap \bar{C})=\frac{1}{3}$ and $P(\bar{A}\cap B\cap \bar{C})=\frac{1}{3}$, then what is $P(B\cap C)$ equal to?

A. $\frac{1}{12}$
B. $\frac{3}{4}$
C. $\frac{1}{15}$

D. $\frac{1}{9}$

59.An unbiased coin is tossed until the first head appears or until four tosses are completed, whichever happens, earlier. Which of the following statements is/are correct?

1) The probability that no head is observed is $\frac{1}{16}$

2) The probability that the experiment ends with three tosses is $\frac{1}{8}$

Select the correct answer using the code given below:

A. 1 only
B. 2 only
C. Both1 and 2
D. Neither 1 nor 2

60.If $x + y + z = 15$ then find the maximum value of x^3yz

A. 3350
B. 6561
C. 7000
D. 7500

61.If $(1 + ay)^n = 1 + 8y + 24y^2 + \cdots \dots \dots \dots$ then find a+n.

A. 6
B. 4
C. 5
D. 3

62.The value of $2\left[2^{\frac{1}{4}} \cdot 4^{\frac{1}{8}} \cdot 8^{\frac{1}{1}}6.16^{\frac{1}{32}} \dots \dots \dots \dots \dots \dots \dots ..\right]$

A. 1
B. 2
C. 3
D. 4

63.If $\frac{x}{x-a}+\frac{x}{x-b}+\frac{x}{x-c} \geq y\, where\, x = a+b+c\,, [a,b,c > 0\,]\, then\, find\, y$

A. $\frac{7}{2}$
B. $\frac{9}{2}$
C. $\frac{11}{2}$
D. $\frac{5}{2}$

64.A person is to count 4500 notes. Let a_n denote the number of notes he counts in the *n*th minute.
If $a_1 = a_2 = a_3 = \ldots = a_{10} = 150,$ and $a_{10}, a_{11}, a_{12}, \ldots$ are in AP with the common difference -2, then the time taken by him to count all the notes is

A. 24 minutes
B. 34 minutes
C. 125 minutes
D. 135 minutes

65.Consider the following statements:

1) The algebraic sum of deviations of a set of values from their arithmetic mean is always zero.

2) Arithmetic mean> Median> Mode for a symmetric distribution.

Which of the above statements is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

66.A man starts repaying a loan as the first instalment of 10000. If he increases the instalment by 500 every month, what amount will he pay in 30thinstalment?

A. 29,500
B. 32,000
C. 31,500

D. 24,500

67.The standard deviation σ of the first N natural numbers can be obtained using which one of the following formulae?

A. $\sigma = \frac{N^2 - 1}{12}$
B. $\sigma = \sqrt{\frac{N^2 - 1}{12}}$
C. $\sigma = \sqrt{\frac{N - 1}{12}}$
D. $\sigma = \sqrt{\frac{N^2 - 1}{6N}}$

68.For the given set of ungrouped data 11, 9, 12, 19, 25, 14, 8, 26, 35. What is median.

A. 12
B. 14
C. 8
D. 35

69.If the number 235 in decimal system is converted into binary system, then what is the resulting number?

A. $(11110011)_2$
B. $(11101011)_2$
C. $(11110101)_2$
D. $(11011011)_2$
E. None of these

70.The binary number expression of the decimal number 31 is

A. 1111
B. 10111
C. 11011
D. 11111

71.If 4x - 5y + 33 = 0 and 20x - 9y = 107 are two lines of regression, then what are the values of $\bar{x}$ and $\bar{y}$ respectively?

A. 12 and 18
B. 18 and 12
C. 13 and 17
D. 17 and 13

72.Consider the following statements:

1) The sum of deviations from mean is always zero.

2) The sum of absolute deviations is minimum when taken around median.

Which of the above statements is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

73.What is the median of the numbers

4.6, 0, 9.3, - 4.8, 7.6, 2.3, 12.7, 3.5, 8.2, 6.1, 3.9,5.2?

A. 3.8
B. 4.9
C. 5.7
D. 6.0

74.If x_1 and x_2 are positive quantities, then the condition for the difference between the arithmetic mean and the geometric mean to be greater than 1 is

A. $x_1 + x_2 > 2\sqrt{x_1 x_2}$
B. $\sqrt{x_1} + \sqrt{x_2} > \sqrt{2}$
C. $|\sqrt{x_1} - \sqrt{x_2}| > \sqrt{2}$
D. $\sqrt{x_1} + \sqrt{x_2} < \sqrt{2}(\sqrt{x_1 x_2} + 1)$

75.Consider the following statements :

1) Variance is unaffected by change of origin and change of scale.

2) Coefficient of variance is independent of the unit of observations.

Which of the statements given above is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

76.Let f be differentiable for all x. If $f(1)=-2$ and $f'(x)\geq 2\ \forall x\in[1,6]$. Then:

A. $f(6)<8$
B. $f(6)\geq 8$
C. $f(6)\leq 5$
D. None

77.Differential constant for $y=A\cos\alpha x+B\sin\alpha x$ where A and B are arbitrary constant, is :

A. $\frac{d^2y}{dx^2}-\alpha^2y=0$
B. $\frac{d^2y}{dx^2}-\alpha y=0$
C. $\frac{d^2y}{dx^2}+\alpha^2y=0$
D. $\frac{d^2y}{dx^2}+\alpha y=0$

78.the function $f(x)=x^3-3x$ is :

A. increasing on $(-\infty,-1)\cup(1,\infty)$ and decreasing on (-1,1)
B. decreasing on $(-\infty,-1)\cup(1,\infty)$ and increasing on (-1,1)
C. increasing on $(0,\infty)$ and decreasing on $(-\infty,0)$
D. decreasing on $(0,\infty)$ and increasing on $(-\infty,0)$

79.Find the equation of the normal to the curve $x^2+2y^2-4x-6y+8=0$ at the point whose ordinate is 1

A. x=2
B. x+y-1=0
C. y=2
D. 3x+y=2

80.Find the interval for which $x+\frac{1}{x}$ is strictly decreasing.

A. [-1,1]
B. (2,3)
C. (-1,1)
D. (0,1)

81.For which of the following interval f(x) = $\log\cos x$ is strictly increasing .

A. $\left(\frac{\pi}{2},\pi\right)$
B. $\left(0,\frac{\pi}{2}\right)$
C. $\left(\pi,\frac{3\pi}{2}\right)$
D. None of these

82.Determine the order and degree of the differential equation given by $\left[1+\left(\frac{dx}{dt}\right)^2\right]^{\frac{3}{2}}=4\frac{d^2x}{dt^2}$

A. 3
B. 2
C. 1
D. $\frac{2}{3}$

83.Form the differential equation corresponding to $y^2-2ky+x^2=k^2$ by eliminating k.

A. $x^2\left(\frac{dy}{dx}\right)^2-4xy\frac{dy}{dx}-x^2=0$

B. $\left(x^2-2y^2\right)\left(\frac{dy}{dx}\right)^2-4xy\frac{dy}{dx}-x^2=0$

C. $\frac{dy}{dx}=1$

D. $\left(x^2-2y^2\right)\left(\frac{dy}{dx}\right)^2-x^2=0$

84.Find the intervals in which the function $f(t)=3t^4-4t^3-12t^2+5$ is strictly increasing.

A. $(-1,0)\cup(2,\infty)$
B. $(-1,0)$
C. $(-\infty,-1)\cup(0,2)$
D. $(2,\infty)$

85.If $y=P\cos ax+Q\sin ax$ then the value of $\frac{d^2y}{dx^2}+a^2y$

A. 1
B. 0
C. a^2
D. A

86.Find the differential equation corresponding to equation given by $xt=ae^t+be^{-t}+t^2$

A. $t\frac{d^2x}{dt^2}+\frac{dx}{dt}-xt+t^2-2=0$

B. $t\frac{d^2x}{dt^2}+2\frac{dx}{dt}-xt+t^2-1=0$

C. $t\frac{d^2x}{dt^2}+2\frac{dx}{dt}+xt+t^2-2=0$

D. $t\frac{d^2x}{dt^2}+2\frac{dx}{dt}-xt+t^2-2=0$

87.If $\int_0^x f(t)\,dt = x + \int_0^x t\,f(t)\,dt$, then the value of f(1) is

A. ½
B. 0
C. 1
D. -1/2

88.At present a firm is manufacturing 2000 items. It is estimated that the rate of change of production P with respect to additional number of workers x is given by dP/dx=100-12√x. if the firm employs 25 more workers, then the new level of production of items is

A. 3000
B. 3500
C. 4500
D. 2500

###COMMON###89###90###**Direction:** Consider $f'(x) = \frac{x^2}{2} - kx + 1$ such that f(0) = 0 and f(3) = 15 ###DONE###

89.

The value of k is

A. $\frac{5}{3}$
B. $\frac{3}{5}$
C. $\frac{-5}{3}$
D. $\frac{-3}{5}$

90. $f''\left(-\frac{2}{3}\right)$ is equal to

A. -1
B. $\frac{1}{3}$
C. $\frac{1}{2}$

D. 1

###COMMON###91###92###**Direction:** Consider the integrals

$A = \int_0^{\frac{\pi}{2}} \frac{\sin x \, dx}{\sin x + \cos x}$ and $B = \int_0^{\frac{\pi}{2}} \frac{\sin x \, dx}{\sin x - \cos x}$

###DONE###

91.

Which one of the following is correct?

A. A = 2B
B. B = 2A
C. A = B
D. A = 3B

92.What is the value of B?

A. $\frac{\pi}{4}$
B. $\frac{\pi}{2}$
C. 3π
D. π

93.The general solution of $\frac{dy}{dx} = \frac{ax+h}{by+k}$ represents a circle only when

A. $a = b = 0$
B. $a = -b \neq 0$
C. $a = b \neq 0, h = k$
D. $a = b \neq 0$

94.Evaluate the $\int \frac{e^x}{\sqrt{4+e^{2x}}} dx$

A. $\log|e^x + \sqrt{4 + e^{2x}}| + c$
B. $\log|\sqrt{4 + e^{2x}}| + c$

C. $\log|e^x| + c$
D. None of the above

95.Find the value of $\int e^{\cos^2 x} \sin 2x dx$

A. $-e^{\sin^2 x} + c$
B. $-e^x + c$
C. $-e^{\cos^2 x} + c$
D. None of the above

96.Evaluate $\int \sqrt{1 + \cos 2x}\, dx$

A. $\sqrt{2} sinx + c$
B. $\sqrt{2} cosx + c$
C. $\sqrt{2} sinxcosx + c$
D. None of the above

###COMMON###97###99###**For the next three (03) items that follow;**

The line 2y = 3x + 12 cuts the parabola 4y = $3x^2$.

###DONE###

97.

Where does the line cut the parabola?

A. At (-2, 3) only
B. At (4, 12) only
C. At both (-2, 3) and (4, 12)
D. Neither at (-2, 3) nor at (4, 12)

98.What is the area enclosed by the parabola and the line?

A. 27 square unit
B. 36 square unit
C. 48 square unit
D. 54 square unit

99.What is the area enclosed by the parabola, the line and the y-axis in the first quadrant?

A. 7 square unit
B. 14 square unit
C. 20 square unit
D. 21 square unit

100.What is the order of the differential equation $\frac{dx}{dy} + \int y\ dx = x^3$?

A. 1
B. 2
C. 3
D. Cannot be determined

101.Find all the points of discontinuity of g(t) such that $g(t) = \begin{cases} t^{10} - 1, t \le 1 \\ t^2, \text{ If } t > 1 \end{cases}$

A. t = 0
B. t = -1
C. t = 1
D. t = 2

102.For $t \in R. f(t) = |\log 2 - \sin t|$ *and* $g(t) = f(f(t)).$*then*:

A. $g'(0) = \cos(\log 2)$
B. g is differentiable at t=0 and $g'(0) = \sin(\log 2)$
C. g is not differentiable at t=0
D. None of these

103.Let $f(x)$ be defined as follows:

$$f(x) = \begin{cases} 2x+1, & -3 < x < -2 \\ x-1, & -2 \le x < 0 \\ x+2, & 0 \le x < 1 \end{cases}$$

Which one of the following statements is correct in respect of the above function?

A. It is discontinuous at x = -2 but continuous at every other point.
B. It is continuous only the interval (-3, -2).
C. It is discontinuous at x = 0 but continuous at every other point.
D. It is discontinuous at every point.

104.Consider the following statements:

1) If $\lim_{x \to a} f(x)$ and $\lim_{x \to a} g(x)$ both exist, then $\lim_{x \to a} \{f(x)g(x)\}$ exists.

2) If $\lim_{x \to a} \{f(x)g(x)\}$ exists, then both $\lim_{x \to a} f(x)$ and $\lim_{x \to a} g(x)$ must exist.

Which of the above statements is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

105.Consider the function

$$f(x) = \begin{cases} ax - 2 & \text{for } -2 < x < -1 \\ -1 & \text{for } -1 \le x \le 1 \\ a + 2(x-1)^2 & \text{for } 1 < x < 2 \end{cases}$$

What is the value of a for which f(x) is continuous at x = - 1 and x = 1?

A. -1
B. 1
C. 0
D. 2

106.Consider the function

$$f(x) = \begin{cases} \dfrac{\tan kx}{x}, & x < 0 \\ 3x + 2k^2 & x \ge 0 \end{cases}$$

What is the non-zero value of k for which the function is continuous at x = 0?

A. 1/4
B. 1/2
C. 1

D. 2

107.If f(t) = $(2t-3)^{\frac{1}{5}}$ then discuss its continuity and differentiability at t = $\frac{3}{2}$

A. f(t) is continuous at t = $\frac{3}{2}$ and not differentiable at t = $\frac{3}{2}$
B. f(t) is not continuous at t = $\frac{3}{2}$ and not differentiable at t = $\frac{3}{2}$
C. f(t) is continuous at t = $\frac{3}{2}$ and differentiable at t = $\frac{3}{2}$
D. f(t) is not continuous at t = $\frac{3}{2}$ and differentiable at t = $\frac{3}{2}$

108.Find all points of discontinuity of g(t) defined by $g(t)=\begin{cases}\frac{t}{|t|}, & \text{if } t<0\\ -1, & t\geq 0\end{cases}$

A. t =0
B. t = 1
C. t = -1
D. None of these

109.The function $f(x)=\log(\cos x)$ in the interval $\left[0,\frac{\pi}{2}\right]$ is,

A. Increasing
B. decreasing
C. strictly increasing
D. strictly decreasing

110.In order that the function $f(x)=(x+1)^{\cot x}$ is continuous at x=0, $f(0)$ must be defined as

A. $f(0)=0$
B. $f(0)=e$

C. $f(0)=\frac{1}{e}$
D. None of these

111.Let f(t) be a continuous function on $[1,5]$. If f takes only rational values for all t and $f(3) = 1.7$ then $f(4)$ is equal to

A. 1.5
B. 1.7
C. 2
D. 5

112.If $y=\frac{1}{x^2+x-2}$ where $x=\frac{1}{t-1}$, then number of points of discontinuous of y = f(t) , $t \in R$ is

A. 1
B. 2
C. 3
D. 4

113.The radius of the circular bubble is increasing at the rate of 0.2cm/sec. find the rate of increase of its surface area when the radius is 7cm.

A. 35.2
B. 34.2
C. 25.6
D. 35

114.Consider the following equation $x\frac{dy}{dx}+\frac{2}{\frac{dy}{dx}}+9=y^2$ and find out the degree and order

A. 2, 0
B. 2,1
C. 1,2
D. 1,1

115.y = ae^{2x} + be^{-3x} is general solution of differential equation

A. $\frac{d^2y}{dx^2}+\frac{dy}{dx}=6y$
B. $x\frac{d^2y}{dx^2}+\frac{dy}{dx}=6y$
C. $\frac{d^2y}{dx^2}+\frac{dy}{dx}-y=0$
D. X$\frac{d^2y}{dx^2}+\frac{dy}{dx}-y=0$

116.The degree of the differential equation satisfying $\sqrt{1+x^2}+\sqrt{1+y^2}=k\{x\sqrt{1+y^2}-y\sqrt{1+x^2} is$

A. 4
B. 3
C. 1
D. 2

117.The differential equation 2 $\frac{dy}{dx}+x^2y=2x+3, y(0)=5\ is$

A. Linear
B. Nonlinear
C. linear with fixed constants
D. undeterminable to be linear or nonlinear

118.Find the general solution of the following equation $\frac{dy}{dx}+y=cosx-sinx$

A. $y=sinx+ce^{-x}$
B. $y=cosx+ce^{-x}$
C. $y=cosx+ce^{x}$
D. None of the above

119.Find the general solution of the following equation $\frac{xdy}{dx}+2y=x^2$

A. $y=\frac{x^2}{4}+Cx^2$
B. $y=\frac{x^2}{4}+C/x^2$
C. $y=x^2+C/x^2$

D. None of the above

120.Consider the following differential equation $\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} + \frac{dy}{dx} = 0$

I. Order of the given equation 3.

II. Degree of given equation is 1

A. Only I
B. Only II
C. Only I and II
D. Neither I and II

121.What is the general Solution of the differential equation $\frac{dy}{dx} + \frac{x}{y} = 0$?

A. $x^2 + y^2 = c$
B. $x^2 - y^2 = c$
C. $x^2 + y^2 = cxy$
D. $x + y = c$

122.Consider the following in respect of the differential equation :

$$\frac{d^2y}{dx^2} + 2\left(\frac{dy}{dx}\right)^2 + 9y = x$$

1) The degree of the differential equation is 1

2) The order of the differential equation is 2

Which of the above statements is/are correct?

A. 1 only
B. 2 only
C. Both 1 and 2
D. Neither 1 nor 2

123. $\int_0^{\frac{\pi}{2}} |\sin x - \cos x| dx$ is equal to

A. 0
B. $2\left(\sqrt{2}-1\right)$
C. $2\sqrt{2}$
D. $2\left(\sqrt{2}+1\right)$

124.The differential equation of the system of circles touching the y-axis at the origin is

A. $x^2+y^2-2xy\frac{dy}{dx}=0$
B. $x^2+y^2+2xy\frac{dy}{dx}=0$
C. $x^2-y^2+2xy\frac{dy}{dx}=0$
D. $x^2-y^2-2xy\frac{dy}{dx}=0$

125.The domain of the definition of the function $f(x)=\sqrt{1-\sqrt{1-\sqrt{1-x^2}}}$,is

A. $(-\infty,1)$
B. $(-1,\infty)$
C. $[0,1]$
D. $[-1,1]$

126.$\lim_{x\to\infty}\frac{e^{x^3}-1}{e^{x^3}+1}$

A. 0
B. 1
C. 2
D. 3

127.Find the rate of change of volume of a sphere with respect to its surface area, when the radius is 10 cm.

A. 3
B. 4
C. 5
D. 6

128.$\frac{d^2x}{dy^2}$ is equal to

A. $\frac{1}{(\frac{dy}{dx})^2}$
B. $\frac{\frac{d^2y}{dx^2}}{\left(\frac{dy}{dx}\right)^2}$
C. $-(\frac{d^2y}{dx^2})/(\frac{dy}{dx})^2$
D. $None\ of\ these$

129.Which one of the following statements is correct in respect of the function
f(x) = x^3 sin x?

A. It has a local maximum at x = 0
B. It has a local minimum at x = 0
C. It has neither maximum nor minimum at x = 0
D. It has a maximum value of 1

130.If f(t) satisfies the conditions of Rolle's theorem in $[1,2]$ and f(t) is continuous in $[1,2]$, then $\int_1^2 f'(x)\,dx$ is equal to -

A. 3
B. 1
C. 0
D. 2

131.Differentiate $\tan^{-1}\left(\frac{\sqrt{1+y^2}-1}{y}\right)$ w.r.t. $tan^{-1}y$, $y \neq 0$

A. $\frac{1}{3}$
B. $\frac{1}{2}$
C. 3

D. 2

132.$Y^2 = a(b^2 - x^2)$

A. $Xyy' + y(y')^2 - y'' = 1$
B. $Xy' + y(y')^2 - yy'' = 0$
C. $(y')^2+yy''=yy'/x$
D. $yy'' + x(y')^2 - yy' = 4$

133.Consider the following statements :

Statement I : $x > \sin x$ for all $x > 0$

Statement II : $f(x) = x - \sin x$ is an increaser function for all $x > 0$

Which one of the following is correct is respect of the above statements?

A. Both Statement I and Statement II are true and statement II is the correct explanation of statement
B. Both Statement I and Statement II are true and statement II is not the correct explanation of statement
C. Statement I is true but Statement II is false
D. Statement I is false but Statement II is true

134.Find the values of $\int_0^1 \frac{e^x}{1+e^{2x}} dx$

A. $\tan^{-1} e - \frac{\pi}{4}$
B. $\tan^{-1} e$
C. $\frac{\pi}{4}$
D. None of the above

135.The derivative of ln(x + sin x) with respect to (x +cos x) is

A. $\frac{1+\cos x}{(x+\sin x)(1-\sin x)}$
B. $\frac{1-\cos x}{(x+\sin x)(1+\sin x)}$
C. $\frac{1-\cos x}{(x-\sin x)(1+\sin x)}$

D. $\frac{1+\cos x}{(x-\sin x)(1-\sin x)}$

136.Find the domain of function $f(t)=\sqrt{sin^{-1}(t)}+\sqrt{t^2-16}+\sqrt{e^{-t}}$

A. $(-1,1)$
B. ϕ
C. $t\in(0,4)$
D. R

137.The Domain and range of R = $\left\{(a,b): b=a+\frac{6}{a}, a,b\in N \ \&a<6\right\}$

A. Domain = {1,2} , Range = {7,5}
B. Domain = {1,2,3} , Range = {7}
C. Domain = {2,3} , Range = {7,5}
D. Domain = {1,2,3} , Range = {7,5}

###COMMON###138###140###Consider the function f(x) = $\frac{x-1}{x+1}$ ###DONE###

138.

What is $\frac{f(x)+1}{f(x)-1}+x$ equal to ?

A. 0
B. 1
C. 2x
D. 4x

139.What is f(2x) equal to ?

A. $\frac{f(x)+1}{f(x)+3}$
B. $\frac{f(x)+1}{3f(x)+1}$
C. $\frac{3f(x)+1}{f(x)+3}$

D. $\frac{f(x)+3}{3f(x)+1}$

140.What is f(f(x)) equal to ?

A. x
B. -x
C. $-\frac{1}{x}$
D. None of the above

141.The inverse of the function $y = 5^{\ln x}$ is

A. $x = y^{\frac{1}{\ln 5}}, y > 0$
B. $x = y^{\ln 5}, y > 0$
C. $x = y^{\frac{1}{\ln 5}}, y < 0$
D. $x = 5\ln y, y > 0$

142.The function $f(x) = |x| - x^3$ is

A. odd
B. even
C. both even and odd
D. neither even nor odd

143.Let $f(n) = \left[\frac{1}{4} + \frac{n}{1000}\right]$, where $[x]$ denote the greatest integer function of x. Then the value of $\sum_{n=1}^{1000} f(n)$ is

A. 251
B. 250
C. 1
D. 0

144.If $f(x) = \frac{4x+x^4}{1+4x^3}$ and $g(x) = \ln\left(\frac{1+x}{1-x}\right)$, then what is the value of $fog\left(\frac{e-1}{e+1}\right)$ equal to?

A. 2
B. 1
C. 0
D. $\frac{1}{2}$

145.If $f(y) = 2y^3 - 9y^2 + 12y + 6$ then find the value of global maximum in (1,3)

A. 10
B. 15
C. 11
D. Does not exist

146.$f(t) = 2t - tan^{-1}(t) - log\left(t + \sqrt{1+t^2}\right)(t > 0)$ *is increasing in*

A. t > 0
B. t > 2
C. t > 3
D. t > -1

147.Find p such that $f(x) = 2x^2 - px + 5$ is increasing on [1,2].

A. $p \leq 2$
B. $p \leq 3$
C. $p \leq 4$
D. $p \geq 2$

148.Find interval of increase of f(t) = $\int_{-1}^{t}(x^2 + 2x)(x^2 - 1)\,dx$

A. $t \in (-2,\infty)$
B. $t \in (-\infty,-2] \cup [-1,0]$
C. $t \in (-\infty,-2] \cup [-1,0] \cup [1,\infty)$
D. $t \in [-1,0] \cup [1,\infty)$

149.A function is defined from natural numbers to integers such that

$$f(x)=\begin{cases}\frac{x-1}{2}, & when\ x\ is\ odd\\ -\frac{x}{2}, & when\ x\ is\ even\end{cases}$$

then f is:

A. Bijective
B. Invertible
C. One to one
D. All of these

150.The point (-2, -3, 4) lies in the

A. First octant
B. Second octant
C. third octant
D. Eighth octant

151.Choose the correctly matched

COLUMN 1 - COLUMN 2

A. Point (2, 3, 4) lies on - (i) 2nd octant
B. A ball is the solid region in the space - (ii) Parallel to Z-axis
C. Z = C represent the plane - (iii) sphere
D. Planes x = a, y = b represent the line - (iv) plane parallel to x y- plane

152.If a parallelepiped passes through A(5, 8, 10) and B(3, 6, 8). what will be length of the diagonal.

A. $2\sqrt{3}$
B. $3\sqrt{2}$
C. $\sqrt{2}$
D. $\sqrt{3}$

153.Show that the triangle ABC with vertices 4(0, 4, 1), B(2, 3, -1) and C(4, 5, 0) is right angled.

A. $AC^2 = AB + BC^2$
B. $BA^2 = CB^2 + BC^2$
C. $BC^2 = AB^2 + BC$

D. $AC^2 = AB^2 + BC^2$

154.A line makes equal angles with co-ordinates axis. Direction cosines of this line are

A. ±(1, 1, 1)
B. $\pm\left(\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}},\frac{1}{\sqrt{3}}\right)$
C. $\pm(\frac{1}{3},\frac{1}{3},\frac{1}{3})$
D. $\pm(\frac{\sqrt{1}}{3},\frac{-\sqrt{1}}{3},\frac{-\sqrt{1}}{3})$

155.Find the value of p for which the line through the points A (4, 1, 2) and B (5, p, 0) is perpendicular to the line through the points C (2, 1, 1) and D (3, 3, -1)

A. $\frac{-2}{3}$
B. $\frac{2}{3}$
C. $\frac{1}{3}$
D. $-\frac{3}{2}$

156.A hemispherical bowl of internal radius 9 cm is full of liquiD. The liquid is to be filled into cylindrical shaped bottles each of radius 1.5 cm and height 4 cm. How many bottles are needed to empty the bowl?

A. 58
B. 64
C. 32
D. 54

157.During conversion of a solid from one shape to another, the volume of new shape will....

A. Increase
B. Decrease
C. Remain unaltered
D. Be doubled

158.Twelve solid hemispheres of same size are made by melting a solid metallic cylinder of base diameter 2 cm and height 16 cm. The diameter of each sphere is

A. 4 cm
B. 3 cm
C. $2\sqrt[3]{2}cm$
D. 6 cm

159.A right circular cylinder of radius r cm and height h cm (where, h > 2r) just encloses a sphere of diameter

A. r cm
B. 2r cm
C. h cm
D. 2h cm

160.The point (1, 3) and (5, 1) are two opposite vertices of a rectangle. The other two vertices lie on the line y = 2x + c. What is the value of c?

A. 2
B. -2
C. 4
D. -4

161.The straight lines x + y – 4 = 0, 3x + y -4 = 0 and x + 3y - 4 = 0 form a triangle, which is

A. isosceles
B. right-angled
C. equilateral
D. scalene

162.The centroid of the triangle with vertices A(2, -3, 3), B(5, -3, -4) and C(2, -3, -2) is the point

A. (-3, 3, -1)
B. (3, -3, -1)
C. (3, 1, -3)
D. (-3, -1, -3)

163.The distance between the parallel planes 4x - 2y + 4z + 9 = 0 and 8x - 4y + 8z + 21 = 0

A. $\frac{1}{4}$
B. $\frac{1}{2}$
C. $\frac{3}{2}$
D. $\frac{7}{4}$

164.Find the centroid of triangle ABC where A(2,2), B(-4,-4) and C(5,-8).

A. (1,1)
B. (1,-10/3)
C. (-1, -10/3)
D. (-1,10/3)

165.Find the area of ΔABC whose vertices are A(-3, -5), B(5, 2) and C(-9, -3).

A. 29
B. 30
C. 28
D. 27

166.Find the equation of the line passing through the point P(4, - 5) and parallel to the line joining the points A(3, 7) and B(- 2, 4).

A. 5x-3y+37=0
B. 3x+5y+37=0
C. 3x-5y-37=0
D. 3x-5y+37=0

167.Find the equation of the line passing through the point (2, 3) and perpendicular to the line 4x + 3y = 10

A. 5x-3y-15=0
B. 5x-3y=1
C. 3x+5y+15=0

D. 5x-3y+25=0

168.Find the distance of the point (3, -5) from the line 3x – 4y = 27

A. 1
B. 2/5
C. 3
D. 4

169.Find the radius of the circle $3(x^2+y^2)-9x+12y+6=0$

A. $\frac{\sqrt{15}}{2}$
B. $\frac{\sqrt{17}}{2}$
C. $\frac{9}{2}$
D. $\frac{\sqrt{21}}{2}$

###COMMON###170###170###Consider the circles $x^2 + y^2 + 4x + m = 0$ and $x^2 + y^2 + 6y + m = 0$ ###DONE###

170.

What is the distance between the centres of the two circles?

A. $\sqrt{13}$
B. 5
C. 3
D. 2

###COMMON###171###171###Consider the circles $x^2 + y^2 + 4x + m = 0$ and $x^2 + y^2 + 6y + m = 0$ ###DONE###

171.

Find the value of 'm' for which the two circles touch each other

A. $m = \frac{15}{8}$
B. $m = \frac{36}{13}$
C. $m = \frac{32}{11}$
D. $m = \frac{26}{7}$

172.Find the equation of the circle which touches the x-axis at the origin and whose radius is 3

A. $x^2 + y^2 - 6y = 0$
B. $x^2 + y^2 + 6y = 0$
C. $2x^2 + 2y^2 - 6y = 0$
D. Both (A) & (B)

173.Find the equation of the circle with centre (3,4) and passing through the point (6,7)

A. $x^2 + y^2 - x + 5y + 25 = 0$
B. $x^2 + y^2 + 8x - 6y + 21 = 0$
C. $x^2 + y^2 - 6x - 8y + 7 = 0$
D. None of these

174.The equation $(x^2 - m^2)^2 + (y^2 - n^2)^2 = 0$ represents points

A. Which are collinear
B. Which lie on a circle having centre (0,m)
C. Which lie on a circle having centre (0,n)
D. None of these

175.The two circles $x^2 + y^2 = r^2$ and $x^2 + y^2 - 10x + 16 = 0$ intersect at two distinct points. Then which one of the following is correct?

A. 2 < r < 8
B. r = 2 r = 8
C. r < 2

D. r > 2

176.What is the equation of the circle which passes through the points (3, -2) and (-2, 0) and having its centre on the line 2x − y − 3 = 0?

A. $x^2 + y^2 + 3x + 2 = 0$
B. $x^2 + y^2 + 3x + 12y + 2 = 0$
C. $x^2 + y^2 + 2x = 0$
D. $x^2 + y^2 = 5$

177.A cone of radius 14cm is of volume 5750 cm^3 is cut at a height of $4/7^{th}$ of its height from top. What will be the volume of new cone? (approximately)

A. 1072
B. 1208
C. 1105
D. 1176

178.A right triangle with 25cm and 7cm rests on shortest side. It is spun around itself with vertical side. Find the volume of resulting figure

A. 1283.3
B. 1232
C. 1256
D. 1278

179.An ice cream cone of height 15cm and radius 3.5cm is stuffed with ice-cream all inside it. In the end half scoop (half sphere) that exactly fits on cone is put on it. What is the amount of ice cream used in cm^3(approximately)

A. 282
B. 192
C. 287
D. 412

180.Find the distance of the point (2,1) from the line x+3y-8=0 measured parallel to 2x-y=1

A. $\sqrt{5}$
B. $\sqrt{7}$
C. $2\sqrt{8}$
D. $7\sqrt{2}$

181.Find angle between pair of lines $-2x^2+xy+3y^2-12x+23y-21=0$

A. $\tan^{-1}(5)$
B. $\tan^{-1}(\sqrt{3})$
C. $\tan^{-1}(3)$
D. $\tan^{-1}(\sqrt{5})$

182.A conical flask id full of water. The flask has base radius r and height h. the water is poured into a cylindrical flask off base radius one. Find the height of water in the cylindrical flask?

A. $\frac{h}{m^2}$
B. 3m
C. $\frac{h}{3m^2}$
D. $\frac{h}{2m^2}$

183.2.2cubic dm of grass is to be drawn into a cylinder wire 0.25cm in diameter. Find the length of wire?

A. 445m
B. 446m
C. 447m
D. 448m

184.If $\begin{vmatrix} a & a^2 & a^3+1 \\ b & b^2 & b^3+1 \\ c & c^2 & c^3+1 \end{vmatrix} = 0$ and the vectors $\vec{A} = (1, a, a^2)$, $\vec{B} = (1, b, b^2)$ and $\vec{C} = (1, c, c^2)$ are non-coplanar. Then abc is equal to

A. 1
B. -1

C. 2
D. 3

185.If the non zero vectors $\vec{a}$ and $\vec{b}$ are perpendicular to each other then the solution of the equation $\vec{r}\times\vec{a}=\vec{b}$ is:

A. $\vec{r}=x\vec{a}+\frac{b}{a^2}\left(\vec{a}\times\vec{b}\right)$
B. $\vec{r}=x\vec{a}-\frac{b}{a^2}\left(\vec{a}\times\vec{b}\right)$
C. $\vec{r}=x\left(\vec{a}\times\vec{b}\right)$
D. $\vec{r}=x\left(\vec{b}\times\vec{a}\right)$

186.If $\vec{a},\vec{b},\vec{c}$ are non coplanar unit vectors such that $\vec{a}\times\left(\vec{b}\times\vec{c}\right)=\frac{\vec{b}+\vec{c}}{\sqrt{2}}$, then the angle between $\vec{a}$ and $\vec{b}$ is:

A. $\frac{3\pi}{4}$
B. $\frac{\pi}{4}$
C. $\frac{\pi}{2}$
D. π

187.If $\vec{a}=3i-2j+2k,\vec{b}=6i+4k-2k,\vec{c}=3i-2j-4k$, then $\vec{a}\left(\vec{b}\times\vec{c}\right)$ is:

A. 118
B. 122
C. -120
D. -144

188.let $\vec{p}$ and $\vec{q}$ be position vectors of P and Q, respectively, with respect to O and $\left|\vec{p}\right|=p$,. The points R and S divide PQ internally and externally in the ratio 2 : 3 respectively. If $\overrightarrow{OR}$ and $\overrightarrow{OS}$ are perpendicular then:

A. $9p^2 = 4q^2$
B. $4p^2 = 9q^2$
C. $9p = 4q$
D. $4p = 9q$

189.If $\vec{a} = i + 2j - 3k$ and $\vec{b} = 3i - j + 2k$, then the angle between the vectors $a + b$ and $a - b$ is:

A. 60°
B. 90°
C. 0°
D. 30°

190.A unity vector in xy plane that makes an angle of 45° with the vector $i + j$ and an angle of 60° with the vector $3i - 4j$ is:

A. i
B. $\frac{(i+j)}{\sqrt{2}}$
C. $\frac{(i-j)}{\sqrt{2}}$
D. none of these

191.The area of a parallelogram whose diagonal coincides with the following pair of vectors is $5\sqrt{3}$. The vectors are:

A. $3i + 2j - k, 3i - j + 4k$
B. $\frac{3}{2}i + \frac{1}{2}j - k, 2i - 6j + 8k$
C. $3i + j - 2k, i + 3j + 4k$
D. none of these

192.The vector c directed along the bisector of the angle between the vectors $\vec{a} = 7i - 4j - 4k$ and $\vec{b} = -2i - j + 2k$, where $|c| = 3\sqrt{6}$ given by:

A. $i-7j+2k$
B. $i+7j+2k$
C. $-(i+7j+2k)$
D. $i-7j-2k$

193.If a line makes angle $\frac{\pi}{3}$ and $\frac{\pi}{4}$ with x-axis and y-axis respectively, then the angle made by the line with z-axis is

A. $\frac{\pi}{2}$
B. $\frac{\pi}{3}$
C. $\frac{\pi}{4}$
D. $\frac{5\pi}{12}$

194.A vector $\vec{r}$ has length 21 and direction ratios are proportional to $2,-3,6$. If $\vec{r}$ makes an acute angle with x-axis, then $\vec{r}=$

A. $6\hat{i}+9\hat{j}-18\hat{k}$
B. $6\hat{i}-9\hat{j}-18\hat{k}$
C. $6\hat{i}-9\hat{j}+18\hat{k}$
D. none of these

195.Let $F(x)=f(x)g(x)h(x)$ for all real x, where $f(x),g(x)\,and\,h(x)$ are different functions. At some point x_o, $F'(x_o)=21F(x_o)$, $f'(x_o)=4f(x_o)$, $g'(x_o)=-7g(x_o)$, $h'(x_o)=kh(x_o)$. Then k is:

A. 36
B. 12
C. 24
D. 6

196.The value of the p for which the functions $f(x)=\begin{cases}\dfrac{\left(4^x-1\right)^3}{\sin(x/p)\log\left(1+\dfrac{x^2}{3}\right)} & x\neq 0\\ 12(\log 4)^2 & x=0\end{cases}$ may be continuous at x=0 is :

A. 1
B. 2
C. 3
D. 4

197.Let $f(x)=x^n$, n being a non-negative integer. The value of n which is equality $f'(a+b)=f'(a)+f(b)$ is valid for all a,b > 0 is

A. 5
B. 1
C. 2
D. 4

198.If $z=x+iy,\ z^{1/3}=a-ib$ and $\frac{x}{a}-\frac{y}{b}=k\left(a^2+b^2\right)$, then the value of k equals

A. 2
B. 4
C. 6
D. 1

199.Let $f(x)=ax^2+bx+c$, $a,b\in R$, $a\neq 0$ satisfying $f(1)+f(2)=0$. Then, the quadratic equation $f(x)=0$ has

A. no real roots
B. 1 and 2 as real roots
C. two equal roots
D. two distinct real roots

200.The solutions set of the equation $\log_x 2.\log_{2x} 2=\log_{4x} 2$, is

A. $\left\{2^{-\sqrt{2}}, 2^{\sqrt{2}}\right\}$

B. $\left\{\frac{1}{2}, 2\right\}$

C. $\left\{\frac{1}{4}, 4\right\}$

D. none of these