Class -12 Autumn Break Home work

Biology

All the work to be done in classwork notebook

Unit – Reproduction in organism

1. Read and revise each chapter in given unit.

2. Prepare 5 question from each chapter.

3. Practice diagrams given in Ncert

Unit – Genetic and Evolution

1. Read and revise each chapter in given unit.

2. Prepare 5 question from each chapter.

3. Practice diagrams given in Ncert

4. Solve the practice test paper provided in the class.

CHEMISTRY INVESTIGATORY PROJECT (2023-24)

Topics

1. Use of shampoo and soap good or bad for our hair and skin
2. Trends of packaged food is increasing now days. What make this packaged food last so long and their effect on our body.
3. Catalysts have played a very vital role in the advancement of our life. Investigate about any two catalyst of your choice and also mention how they have affected our life.
4. Coordination complexes have numerous uses as medicines, dyes, catalyst etc. choose any three complexes which have been used as medicines for treatment of various diseases.
5. Paracetamol a widely used antipyretic and analgesic drug, investigate about its chemical structure and its functioning.
6. Finding EMF of Electrochemical cell.
7. Chocolate analysis
8. Chemistry in black and white photography.
9. Discoveries in the field of Chemistry. study of last two Nobel prize winners in the field of chemistry.
10. To prepare the pigment and poster paints.

A project could have the following outline:

1. Statement of Problem- A clear statement of the problem/need that has given rise to the project

2. Objectives-General and specific objectives of topic

3. Introduction-The introduction should describe the relevance of problem or why the problem is the most appropriate for your inquiry. It should also describe previously known facts about your problem question with proper bibliography. Introduction towards end briefly includes hypothesis your hypothesis and the method to test it.

4. Problem question (specific, concrete questions to which concrete answers can be given) and/ or hypotheses

5. Methods/Procedures Methodology (will your research be based on survey, an experimental investigation, historical study, ethnographic study or content analysis). Methods describe the experiments proposed or the observations planned to make and the detailed process of analysis of data/observations. Methods proposed should be feasible and be able to adequately answer problem question.

6. Materials/Resources required

7. Observations/Data gathered Using the procedures mentioned in introduction, experiments should be conducted and data should be recorded. Interesting things that happened during the conduct of experiments should also be recorded.

8. Analysis of data and discussion of result Data should be interpreted in terms of proposed hypothesis. Data should be tabulated and interpreted with the help of graphs if possible. The interpretation should be done in an honest manner even if it does not support proposed hypothesis.

9. Conclusion Reporting and writing up the report Discussion of new learning from the study may be covered under conclusion. This may have possible suggestions for future studies.

10. Limitation of the study The limitations of the study are those features of design or procedure that might have affected the interpretation of the results of study. The limitations are alternatively interpreted as flaws or shortcomings due to flawed methodology, observations, small number of experiments or non-peer reviewed nature of study etc.

11. Bibliography

Autumn Break HOME WORK (2023-24)

CLASS: XII Science SUBJECT: Computer Science Completion of Practical File

1. Write a program using Function to calculate Profit or Loss
2. Write a program using function to calculate Factorial of any number
3. Write a program using Function to Count Vowel in a string.
4. Write a program using Functions to count how many words in a string.
5. Write a program using Function to check a string is palindrome or not
6. Write a program to read data from text file and count no. of His and Her words separately
7. Write a program to write data in a text file.
8. Write a program to count no. vowels from a text file.
9. Write a program to count no. of lines starts with vowel in a file.
10. Write a program to write student data in Binary File.
11. Write a program to read and display record from binary file.
12. Write a program to delete a record from binary file.
13. Write a program to update a record in binary file.
14. Write a program to write data in CSV File.
15. Write a program to read and display record from CSV file.
16. Write a program to modify a record in CSV File.
17. Write a program to implement stack using list.
18. Networking – Case Study question-1
19. Networking – Case Study question-2
20. SQL- Patient Table queries 20
21. SQL- Flight Table queries 12
22. SQL- Joining Table 16 Queries.
23. Connectivity of SQL and Python 2 coding.

Autumn Break HOME WORK (2023-24)

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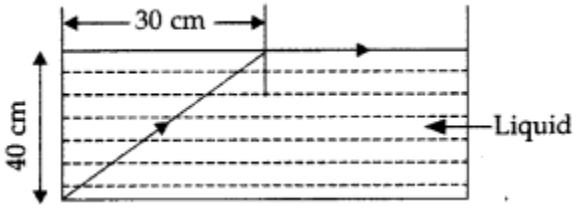
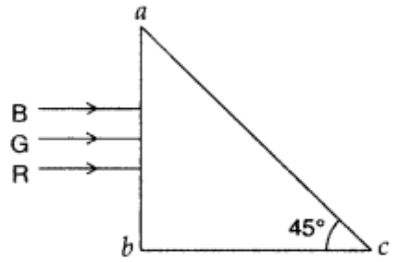
WORKSHEET -1

(Refractive Index and TIR)

1. A glass lens of refractive index 1.5 is placed in a trough of liquid. What must be the refractive index of the liquid in order to make the lens disappear?
2. A glass lens of refractive index 1.45 disappears when immersed in a liquid. What is the value of refractive index of the liquid?
3. (i) What is the relation between critical angle and refractive index of a material?
   (ii) Does critical angle depend on the colour of light? Explain.
4. Calculate the speed of light in a medium whose critical angle is 30°.
5. For the same value of angle of incidence, the angles of refraction in three media A, B and C are 15°, 25° and 35° respectively. In which medium would the velocity of light be minimum?
6. State the conditions for the phenomenon of total internal reflection to occur.
7. (i) Define refractive index of a medium.
8. (ii) In the following ray diagram, calculate the speed of light in the liquid of unknown refractive index.



9. Three light rays red (R), green (G) and blue (B) are incident on a right B angled prism ‘abc’ Q at face ‘ab’. The R refractive indices of the material of the prism for red, green and blue wavelengths are 1.39, 1.44 and 1.47 respectively. Out of the three which colour ray will emerge out of face ‘ac’? Justify your answer. Trace the path of these rays after passing through face ‘ab’.



WORKSHEET -2

(Lens Maker’s and Thin Lens Formula Previous Year Questions)

1. A converging lens of refractive index 1.5 is kept in a liquid medium having the same refractive index. What would be the focal length of the lens in this medium?
2. How does the power of a convex lens vary, if the incident red light is replaced by violet light?
3. Two thin lenses of power + 4D and – 2D are in contact. What is the focal length of the combination?
4. Under what condition does a biconvex lens of glass having a certain refractive index act as a plane glass sheet when immersed in a liquid?
5. A biconvex lens made of a transparent material of refractive index 1.5 is immersed in water of refractive index 1.33. Will the lens behave as a converging or a diverging lens? Give reason.
6. The radii of curvature of the faces of a double convex lens are 10 cm and 15cm. If focal length of the lens is 12 cm, find the refractive index of the material of the lens.

7. A convex lens of focal length 25 cm is placed coaxially in contact with a concave lens of focal length 20 cm. Determine the power of the combination. Will the system be converging or diverging in nature?
8. The image obtained with a convex lens is erect and its length is four times the length of the object. If the focal length of the lens is 20 cm, calculate the object and image distances.
9. Derive the lens formula for a a) concave lens b) Convex lens using the necessary ray diagram.
10.Two lenses of powers 10 D and – 5 D are placed in contact.
(a) Calculate the power of the new lens.
(b) Where should an object be held from the lens, so as to obtain a virtual image of magnification 2?
11. Obtain the expression for lens maker formula for a) Concave lens b) Convex lens

WORKSHEET -3
(Refraction through a Prism)
1. Obtain the relationship between refractive index n, angle of incidence 'i', angle of prism 'A' and angle of minimum deviation for a triangular prism.
2. How does the angle of minimum deviation of a glass prism vary, if the incident violet light is replaced by red light? Give reason.
3. A ray of light passing through an equilateral triangular glass prism from air undergoes minimum deviation when angle of incidence is 3/4th of the angle of prism. Determine the angle of deviation and the refractive index of the glass prism.
4. (i) A ray of light incident on face AB of an equilateral glass prism, shows minimum deviation of 30°. Calculate the speed of light through the prism.
(ii) Find the angle of incidence at face AB so that the emergent ray grazes along the face AC.

WORKSHEET -4
(Microscope Previous Year Questions)
1. Draw a ray diagram showing the image formation by a compound microscope. Hence obtain the expression for total magnification when the image is formed at infinity.
2. You are given two converging lenses of focal lengths 1.25 cm and 5 cm to design a compound microscope. If it is desired to have a magnification of 30, find out the separation between the objective and the eyepiece.
3. Define the magnifying power of a compound microscope when the final image is formed at infinity. Why must both the objective and the eyepiece of a compound microscope have short focal lengths? Explain.
4. A compound microscope uses an objective lens of focal length 4 cm and eyepiece lens of focal length 10 cm. An object is placed at 6 cm from the objective lens. Calculate the magnifying power of the compound microscope. Also calculate the length of the microscope.
5. (a) Draw a labelled ray diagram showing the formation of a final image by a compound microscope at least distance of distinct vision. Also derive expression for magnifying power.
(b) The total magnification produced by a compound microscope is 20. The magnification produced by the eyepiece is 5. The microscope is focused on a certain object. The distance between the objective and the eyepiece is observed to be 14 cm. If the least distance of distinct vision is 20 cm, Calculate the focal length of the objective and the eyepiece.
6. An optical instrument uses eye-lens of power 20 D and the objective lens of power 50 D. It has a tube length of 15 cm. Name the optical instrument and calculate its magnifying power if it forms the final image at infinity.

WORKSHEET -5
(Telescope Previous Year Questions)
1. Draw a ray diagram of a reflecting type telescope. State two advantages of this telescope over a refracting telescope.
2. Draw a labelled ray diagram of an astronomical telescope in the near point position. Write the expression for its magnifying power.

3. A small telescope has an objective lens of focal length 150 cm and eyepiece of focal length 5 cm. What is the magnifying power of the telescope for viewing distant objects in normal adjustment?
If this telescope is used to view a 100 m tall tower 3 km away, what is the height of the image of the tower formed by the objective lens?
4. (i) Draw a neat labelled ray diagram of an astronomical telescope in normal adjustment/Image formed at infinity. Explain briefly its working.
(ii) An astronomical telescope uses two lenses of powers 10 D and 1 D. What is its magnifying power in normal adjustment?
5. A giant refracting telescope at an observatory has an objective lens of focal length 15 m. If an eyepiece lens of focal length 1.0 cm is used, find the angular magnification of the telescope. If this telescope is used to view the moon, what is the diameter of the image of the moon formed by the objective lens? The diameter of the moon is 3.42×10^6 m and the radius of the lunar orbit is 3.8×10^6 m.
6. The sum of focal lengths of the two lenses of a refracting telescope is 105cm. The focal length of one lens is 20 times that of the other. Determine the total magnification of the telescope when the final image is formed at infinity.

WORKSHEET -6
(Wave Optics Previous Year Questions)
1. (a) In Young's double slit experiment a monochromatic source of light S is kept equidistant from the slits S2 and S2. Explain the formation of dark and bright fringes on the screen. Also state expression for fringe width.
(b) A beam of light consisting of two wavelengths, 650 nm and 520 nm, is used to obtain interference fringes in Young's double-slit experiment.
(i) Find the distance of the third bright fringe on the screen from the central maximum for wavelength 650 nm?
(ii) What is the least distance from the central maximum where the bright fringes due to both the wavelengths coincide? Given : the separation between the slits is 4 mm and the distance between the screen and plane of the slits is 1.2 m.
2. State Huygen's Principle. Use Huygens' principle to show how a plane wavefront propagates from a denser to rarer medium. Hence verify Snell's law of refraction.
3. (a) The ratio of the widths of two slits in Young's double slit experiment is 4 : 1. Evaluate the ratio of intensities at maxima and minima in the interference pattern.
(b) Does the appearance of bright and dark fringes in the interference pattern violate, in any way, conservation of energy?
4. A plane wavefront is incident at an angle of incidence on a reflecting surface. Draw a diagram showing incident wavefront, reflected wavefront and verify the laws of reflection.
5. (a) In Young's double slit experiment, the two slits are illuminated by two different lamps having the same wavelength of light. Explain with reason, whether interference patterns will be observed on the screen or not.
(b) Light waves from two coherent sources arrive at two points on a screen with path differences of 0 and $\lambda/2$. Find the ratio of intensities at the points.
6. Draw the wavefront when the incident wavefront passes through
a) Prism b) Concave mirror c) Convex lens.
7. Draw a wavefront for a) point source b) line source c) distant source.
8. Define a) Coherent sources b) Sustained Interference
9. Draw the diagram to demonstrate the diffraction due to a single slit of width a. Also calculate the condition for maxima and minima.

KV BSF JALALABAD

AUTUMN BREAK HOME WORK

CLASS XII SESSION 2023-24

(DAY -1 :- 20/10/2023)

RELATIONS & FUNCTIONS

1. Let A and B be two finite sets with n (A) = m and n (B) = n with m = n then find the number of bijective functions from A to B.

2. Let A = {1,2,3}. Find the number of equivalence relations containing (1,2) .

3. If A = {1,2,3}, B = {4,6,9} and R is a relation from A to B defined by ' x is smaller than y'.Write the range of R.

4. State whether The relation R = { (1,1),(2,2),(3,3)} on {1,2,3} is equivalence relation or not.

5. Let A = **R** - {3} and B = **R** - {1}. Consider the function f : A $\rightarrow$B defined by f (x) =$\left(\frac{x-2}{x-3}\right)$Is f one-one and onto? Justify your answer

6. Consider a function f : $R_+ \rightarrow [-5, \infty)$ defined $f(x) = 9x^2 + 6x - 5$. Show that f is one- one and onto function, Where R_+ is the set of all non-negative real numbers.

7. Show that the function f: R $\rightarrow$ {x $\in$ R :-1 < x < 1} defined by $f(x) = \frac{x}{1+|x|}$, x $\in$ R is one- one and onto function.

8. Show that the relation R in the set A = {1, 2, 3, 4, 5} given by R = {(a, b) : |a - b| is even}, is an equivalence relation. Show that all the elements of {1, 3, 5} are related to each other and all the elements of {2, 4} are related to each other. But no element of {1, 3, 5} is related to any element of {2, 4}.

9. Show that each of the relation R in the set A = {x $\in$ **Z** : 0 ≤ x ≤ 12}, given by

R = {(a, b) : |a - b| is a multiple of 4} is an equivalence relation. Find the set of all

elements related to 1.

10. Let N denote the set of all natural numbers and R be the relation on N×Ndefined by $(a,b)R(c,d)\Leftrightarrow ad(b+c)=bc(a+d)$ prove that R is an equivalence relation on N×N.

ANSWERS

1)[n!]2) {4,6,9} 3) Equivalence Relation 9) {1, 5, 9}

(DAY -2 :- 21/10/2023)

INVERSE TRIGONOMETRIC FUNCTIONS

* Domain & Range of the Inverse Trigonometric Function :

	Functions	*Domain*	*Range* (Pr *incipal value Branch*)
I.	$\sin^{-1}$:	$[-1,1]$	$[-\pi/2,\pi/2]$
II.	$\cos^{-1}$:	$[-1,1]$	$[0,\pi]$
III.	$\cos ec^{-1}$:	$R-(-1,1)$	$[-\pi/2,\pi/2]-\{0\}$
IV.	$\sec^{-1}$:	$R-(-1,1)$	$[0,\pi]-\{\pi/2\}$
V.	$\tan^{-1}$:	R	$(-\pi/2,\pi/2)$
VI.	$\cot^{-1}$:	R	$(0,\pi)$

1). Find the principal value of $\sec^{-1}(-2)$.

2) Find the principal value of $\sin^{-1}\left(\cos\frac{2\pi}{3}\right)$.

3) Find the principal value of $\cot^{-1}\left(\tan\frac{3\pi}{4}\right)$.

4). Find the value of $\sin^{-1}\left\{\cos(\sin^{-1}\frac{\sqrt{3}}{2})\right\}$.

5). Find the value of $\cot\left[\sin^{-1}\left\{\cos\left(\tan^{-1}1\right)\right\}\right]$.

6) . Principal value of $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$ is equal to

7) Evaluate :- $\cos^{-1}\left(\cos\frac{2\pi}{3}\right)+\sin^{-1}\left(\sin\frac{2\pi}{3}\right)$ 8) Evaluate :- $\cos^{-1}\left(\cos\frac{7\pi}{6}\right)$

9) Write the principal value of $\tan^{-1}\left(\sqrt{3}\right)-\cot^{-1}\left(-\sqrt{3}\right)$.

10) Write the value of $\tan^{-1}\left[2\sin\left(2\cos^{-1}\frac{\sqrt{3}}{2}\right)\right]$

ANSWERS

1). $\frac{2\pi}{3}$	2). $-\frac{\pi}{6}$	3) $-\frac{\pi}{4}$	4) $\frac{3\pi}{4}$	5) $\frac{\pi}{6}$
6) $\frac{5\pi}{6}$	7) $\frac{5\pi}{3}$	8) $\frac{5\pi}{6}$	9) $\frac{\pi}{2}$	10 $-\frac{\pi}{3}$

(DAY -3 :- 22/10/2023)

MATRICES

1) If $\begin{bmatrix}2x & 3\end{bmatrix}\begin{bmatrix}1 & 2\\ -3 & 0\end{bmatrix}\begin{bmatrix}x\\ 8\end{bmatrix}=\mathrm{O}$, find x.

2) Find the matrix P satisfying the matrix equation $\begin{bmatrix}2 & 1\\ 3 & 2\end{bmatrix}\mathrm{P}\begin{bmatrix}-3 & 2\\ 5 & -3\end{bmatrix}=\begin{bmatrix}1 & 2\\ 2 & -1\end{bmatrix}$. Also find a matrix Q such that P + Q = O, where O is a zero matrix

3) If $\mathrm{A}=\begin{bmatrix}0 & -\tan\frac{\alpha}{2}\\ \tan\frac{\alpha}{2} & 0\end{bmatrix}$ and $\mathrm{I}=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$. Prove that $\mathrm{I}+\mathrm{A}=(\mathrm{I}-\mathrm{A})\begin{bmatrix}\cos\alpha & -\sin\alpha\\ \sin\alpha & \cos\alpha\end{bmatrix}$

4) If A = $\begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$, find x and y such that $A^2 + xI = yA$. Also find the value of $(x - y)$.

5) For what value of x: $[1 \quad 2 \quad 1]\begin{bmatrix} 1 & 2 & 0 \\ 2 & 0 & 1 \\ 1 & 0 & 2 \end{bmatrix}\begin{bmatrix} 0 \\ 2 \\ x \end{bmatrix} = O$. Use the value of x to find A^2, if

A= $\begin{bmatrix} x & -x \\ -x & x \end{bmatrix}$.

6) If A = $\begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$, show that $A^2 - 5A - 14I = O$.

7) Let A = $\begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}$, B = $\begin{bmatrix} 5 & 2 \\ 7 & 4 \end{bmatrix}$, C = $\begin{bmatrix} 2 & 5 \\ 7 & 4 \end{bmatrix}$. Find a matrix D such that CD - AB = O.

8) Express A = $\begin{bmatrix} 3 & 2 & 3 \\ 4 & 5 & 3 \\ 2 & 4 & 5 \end{bmatrix}$ as the sum of a symmetric(P) and a skew-symmetric (Q) matrix. Also find $P^T + Q^T$.

9) If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, then prove that $A^2 - 4A - 5I = 0$ and, hence find A^{-1}.

10) Let A = $\begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$ and $f(x) = x^2 - 4x + 7$. Show that f(A) = O. Use this result to find A^5.

ANSWERS

1) $x = 0, x = \frac{-23}{2}$ 2) P= $\begin{bmatrix} 25 & 15 \\ -37 & -22 \end{bmatrix}$, Q = $\begin{bmatrix} -25 & -15 \\ 37 & 22 \end{bmatrix}$ 4) . x = 8, y = 8; 0

5) x = -1, A^2 = $\begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix}$ 7. D = $\begin{bmatrix} -191 & -110 \\ 77 & 44 \end{bmatrix}$ 8) $\begin{bmatrix} 3 & 3 & 5/2 \\ 3 & 5 & 7/2 \\ 5/2 & 7/2 & 5 \end{bmatrix} + \begin{bmatrix} 0 & -1 & 1/2 \\ 1 & 0 & 1/2 \\ -1/2 & 1/2 & 0 \end{bmatrix}$; $\begin{bmatrix} 3 & 4 & 2 \\ 2 & 5 & 4 \\ 3 & 3 & 5 \end{bmatrix}$

9) A^{-1} = $\begin{bmatrix} -3 & 2 & 2 \\ 2 & -3 & 2 \\ 2 & 2 & -3 \end{bmatrix}$ 10. $\begin{bmatrix} -118 & -93 \\ 31 & -118 \end{bmatrix}$

(DAY -4 :- 23/10/2023)

Determinants

1. Using matrix method, solve: x + y + z = 6; y + 3z = 11; x - 2y + z = 0

2. Using matrix method, solve: 3x - 2y +3z = 8; 2x + y - z = 1; 4x -3 y +2z = 4

3. Solve the system using matrices: $\frac{2}{x}+\frac{3}{y}+\frac{10}{z}=4;\ \frac{4}{x}-\frac{6}{y}+\frac{5}{z}=1;\ \frac{6}{x}+\frac{9}{y}-\frac{20}{z}=2$

4. If A = $\begin{bmatrix} 2 & 3 & 1 \\ -3 & 2 & 1 \\ 5 & -4 & -2 \end{bmatrix}$, find A^{-1} and use it to solve the system of equations:

2x - 3y + 5z = 11, 3x + 2y - 4z = - 5, x + y - 2z = - 3

5. Using matrices, solve the following system of equations:

(i) x + 2y - 3z = - 4
2x + 3y + 2z = 2
3x - 3y - 4z = 11

(ii) 4x + 3y + 2z = 60
x + 2y + 3z = 45
6x + 2y + 3z = 70

6. Find the product AB, where A == $\begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix}\begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix}$ and use it to

solve the equations: x - y + z = 4, x - 2y - 2z = 9, 2x + y + 3z = 1

7. Using matrices, solve the following system of equations:

$\frac{1}{x}-\frac{1}{y}+\frac{1}{z}=4;\quad \frac{2}{x}+\frac{1}{y}-\frac{3}{z}=0\ ,\quad \frac{1}{x}+\frac{1}{y}+\frac{1}{z}=2$

8. Find the product AB, where A = $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix}$ and B= $\begin{bmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$ and

use it to solve: x - y +2 z = 1, 2y - 3z = 1, 3x - 2y + 4z = 2.

9. Find A^{-1} if A = $\begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$ and show that $A^{-1} = \frac{A^2-3I}{2}$.

10. Given A = $\begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$, B = $\begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$, find BA and use this to solve the system of equations: $y + 2z = 7, x - y = 3, 2x + 3y + 4z = 17$.

ANSWERS

1. x = 1, y = 2, z = 3 2. x = 1, y = 2, z = 3 3. x = 2, y = 3, z = 5

4. x = 1, y = 2, z = 3 5. (i) x = 3, y = -2, z = 1 (ii) x = 5, y = 8, z = 8

6. AB = 8I, x = 3, y = - 2, z = -1 7. x = $\frac{1}{2}$, y = -1, z = 1

8. x = 0, y = 5, z = 3 9. A^{-1} = $\begin{bmatrix} -1 & 1 & 1 \\ 1 & -1 & 1 \\ 1 & 1 & -1 \end{bmatrix}$ 10. x =2, y = -1, z = 4

(DAY -5 :- 24/10/2023)

CONTINUITY AND DIFFERENTIABILITY

1. Find the value of k for which f(x) = $\begin{cases} \frac{\sqrt{1+kx}-\sqrt{1-kx}}{x}, & -1 \le x < 0 \\ \frac{2x+1}{x-1}, & 0 \le x \le 1 \end{cases}$ is continuous at x = 0 .

2. If f(x) = $\begin{cases} 3ax + b, & \text{if } x > 1 \\ 11 & \text{if } x = 1 \\ 5ax - 2b, & \text{if } x < 1 \end{cases}$, continuous at x = 1,find the values of a and b.

3. If f(x) = $\begin{cases} \frac{1-\sin^3 x}{3\cos^2 x}, & \text{if } x < \frac{\pi}{2} \\ a & \text{if } x = \frac{\pi}{2} \\ \frac{b(1-\sin x)}{(\pi-2x)^2} & \text{if } x > \frac{\pi}{2} \end{cases}$ is continuous at x = $\frac{\pi}{2}$, find a, b.

4. If $y = (\log_e x)^x + x^{\log_e x}$ find $\frac{dy}{dx}$.

5. If $x = a(\theta - \sin\theta)$, $y = a(1 + \cos\theta)$, find $\frac{d^2y}{dx^2}$ at $\theta = \frac{\pi}{2}$

6 If $x = a\left(\cos\theta + \log\tan\frac{\theta}{2}\right)$ and $y = a\sin\theta$ find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$.

7. If $y = \sin\left(m\sin^{-1}x\right)$, prove that $\left(1 - x^2\right)\frac{d^2y}{dx^2} - x\frac{dy}{dx} + m^2y = 0$

8. If $x^m.y^n = (x + y)^{m+n}$, prove that $\frac{dy}{dx} = \frac{y}{x}$

9. If $x\sqrt{1+y} + y\sqrt{1+x} = 0$, $-1 < x < 1$, prove that $\frac{dy}{dx} = -\frac{1}{(1+x)^2}$

10. If $y = \sqrt{x + \sqrt{x + \sqrt{x + ...\infty}}}$, then find $\frac{dy}{dx}$.

11. If $(\cos x)^y = (\sin y)^x$, then find $\frac{dy}{dx}$.

ANSWERS

1. k = -1	**2** $a = 3, b = 2$	**3.** $a = \frac{1}{2}$, $b = 4$

(DAY -6 :- 25/10/2023)

APPLICATION OF DERIVATIVES

1. Find the intervals in which function f(x) = $2x^3 - 15x^2 + 36x + 1$ is strictly increasing or strictly decreasing.

2. Find the intervals in which function *f(x) = sin x - cos x*, $0 \le x \le 2\pi$, is strictly increasing or strictly decreasing.

3. . Find the absolute maximum and minimum values of a function *f* given by $f(x) = 2x^3 - 15x^2 + 36x + 1$ on the interval [1, 5].

4. A man whose height is 2 m walks at a uniform speed of 6 m/minutes away from a lamp post 5 m high. Find the rate at which the length of his shadow increases.

5. Water is leaking from a conical funnel at the rate of 5 cm ^{2} /s. If the radius of the base of the funnel is 5 cm and the altitude is 10 cm, find the rate at which the water level is dropping when it is 2.5 cm from the top.
6. The length x of a rectangle is decreasing at the rate of 3 cm/minute and the width y is increasing at the rate of 2cm/minute. When x =10cm and y = 6cm, find the rates of change of (a) the perimeter and (b) the area of the rectangle.

7. The volume of a cube is increasing at the rate of 8 cm^3/s. How fast is the surface area increasing when the length of an edge is 12 cm?

8. Show that the volume of the largest cone that can be inscribed in a sphere of radius R is 8/27 of the volume of the sphere.
9. 17. Show that semi-vertical angle of right circular cone of given surface area and maximum volume is $Sin^{-1}(1/3)$.

10. An open box with a square base in to be made out of a given quantity of sheet of area c^2.Show that the maximum volume of the box is $\frac{c^3}{6\sqrt{3}}$.

11. A rectangular sheet of tin 45 cm by 24 cm is to be made into a box without top by cutting off squares from each corner and folding up the flaps. What should be the side of the square to be cut off so that the volume of the box is the maximum possible?

12. Find the interval in which the function f given by $f(x) = x^2e^{-x}\ is$ strictly increasing.

(DAY -7 :- 26/10/2023)

INDEFINITE & DEFINITE INTEGRALS

1. 1. $\int \frac{1}{\sqrt{x}+x}\,dx$ 2. $Evluate: \int \sqrt{\tan x}\,dx$

3. $\int \frac{1}{sin(x-a).cos(x-b)}dx$ 4. $\int tanx.tan2x.tan3x\,dx$

5. $\int \frac{sinx-xcosx}{x(x+sinx)}\,dx$ 6. $\int \frac{1}{(\sqrt{x}+\sqrt[3]{x})}\,dx$ 7. $\int \frac{x^4+1}{x^2+1}dx$ 8. $\int \frac{x\sin^{-1}x}{\sqrt{1-x^2}}dx$

9. $\left(\int e^{2x}\frac{1+sin2x}{1+cos2x}\right)dx$ 10. $\int \frac{sec^4x}{\sqrt{tanx}}\,dx$ 11. $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \sqrt{1+sin2x}\,dx$

12. If $\int_a^b x^3dx = 0$ and if $\int_a^b x^2dx = \frac{2}{3}$ find a and b.

13. $$Evaluate: \int_{\frac{\pi}{4}}^{\frac{\pi}{2}} cosx\,.log(sinx)dx$$

14. $Evaluate: \int_1^3 (|x-1| + |x-2| + |x-3|)dx$

15. $$\int_0^{\pi/4} \log(1+\tan x)\,dx$$

16. Prove that: $\int_0^{\frac{\pi}{2}} sin2x\,.log(tanx)dx = 0$

17. Evaluate:

$$\int_0^{\frac{\pi}{2}} \frac{x\,sinx}{1+cos^2x}\,dx$$

18. $Evaiuate: \int_{-2}^{2} \frac{x^2}{1+5^x}\,dx$

19.

$$\int_0^{\frac{\pi}{2}} 2sinx.cosx.\tan^{-1}(sinx)\,dx$$

20. $\int_0^1 \frac{log(1+x)}{1+x^2}\,dx$

Answer

1. $2\log_e\left|1+\sqrt{x}\right|+C$ **2.** $\frac{1}{\sqrt{2}}\tan^{-1}\left(\frac{tanx-1}{\sqrt{2tanx}}\right)+\frac{1}{2\sqrt{2}}log\left|\frac{tanx-\sqrt{2tanx}+1}{tanx+\sqrt{2tanx}+1}\right|+c$

3. $\frac{1}{cos(x-b)}[\,logsin(x-a)-cos(x-b)]+c$

4. $\frac{1}{3}logcos3x+\frac{1}{2}logcos2x+logcosx+c$ 5. log x- log(x+sinx)+c

6. $2\sqrt{x}$ -$3\sqrt[3]{x}$+$6x^{\frac{1}{6}}$-6log$(x^{\frac{1}{6}}+1)+c$ 7. $\frac{x^3}{3}-x+2\tan^{-1}x+c$

8. - $\sqrt{1-x^2}\sin^{-1}x$ +x+c 9.$\frac{1}{2}$e^{2x} tanx +c 10.$2\sqrt{tanx}$ +$\frac{2}{5}tan^{\frac{5}{2}}x$+c

11. $\sqrt{2}$ -1 12. A=-1, b=1 13.$\frac{1}{4}log2-\frac{\pi}{8}+\frac{1}{4}$ 14. 5 15. $\frac{\pi}{8}$ log 2

17. $\frac{\pi^2}{4}$ 18.$\frac{8}{3}$ 1 9. $\frac{\pi}{2}-1$ 20. $\frac{\pi}{8}log2$

(DAY -8 :- 27/10/2023)

APPLICATION OF INTEGRATION

1. Find the area enclosed by the circle $x^2+y^2=2$.
2. Find the area of the region bounded by the curve $y = x^2$ and the line $y = 16$.

3. Find the area of the region bounded by the curve $y = \sqrt{16-x^2}$ and x-axis.

4. Find Area of the region bounded by y^2= 4x, y-axis, and the line y = 3.

5. Find The area of the region bounded by the curve x = 2y + 3 and the y lines,

y = 1 and y = -1

6. Sketch the region of the ellipse $\frac{x^2}{25}+\frac{y^2}{16}=1$ and find its area, using integration.
7. Sketch the graph of y = $|x+3|$ and evaluate the area under the curve y = $|x+3|$ above x-axis and between x = - 6 to x = 0. using integration.
8. Find the area of the region bounded by $x^2 = 4y$, y = 2, y = 4 and the y-axis in the first quadrant using integration
9. Find the Areaof Triangle having vertices A (2 , 3) , B (4 , 7) C (6 , 2)
10. Find the Area of Triangle bounded by lines :- 3x +3 - 2y = 0 , x + 2y -7 = 0 , x-2y+1=0

Answers:

1. 2π sq units
2. $\frac{256}{3}$ sq units
3. 8π sq units
4. $\frac{9}{4}$ sq units
5. 6 sq units
6. 20π sq units
7. 9 Sq. units
8. $16-4\sqrt{2}\ sq.units$
9. 9 sq units
10. 4 sq units

(DAY -9 :- 28/10/2023)

DIFFERENTIAL EQUATIONS

1. Find the particular solution of the differential equation
   $(1+e^{2x})dy+(1+y^2)e^x=0$; given that y=1 and x=0
2. Find the particular solution of the differential equation
   $\log\left(\frac{dy}{dx}\right)=3x+4y,$ given that y=0 when x=0
3. Solve the following differential equation :
   $\left(x\sin^2\frac{y}{x}-y\right)dx+xdy=0$
4. Solve the following differential equation :
   $xdy-ydx=\sqrt{x^2+y^2}\,dx$
5. Find the solution of the differential equation
   $(xdy-ydx)y\sin\left(\frac{y}{x}\right)=(ydx+xdy)x\cos\left(\frac{y}{x}\right)$
6. Solve the following differential equation:
   $x\log x\frac{dy}{dx}+y=\frac{2}{x}\log x$
7. Solve the differential equation:
   $x\frac{dy}{dx}+y-x+xy\cot x=0, x\neq 0$
8. Find the particular solution of the differential equation
   $\frac{dy}{dx}+y\cot x=2x+x^2\cot x, x\neq 0$ given that y= 0 and x = pie / 2
9. Find the general solution of the differential equation
   $ydx-(x+2y^2)dx=0$
10. solve the differential equation
    $(\tan^{-1}y-x)dy=(1+y^2)dx$

Answer

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1. $\tan^{-1}y+\tan^{-1}e^x=\frac{\pi}{2}$
2. $4e^{3x}+3e^{-4y}=7$
3. $\cot\left(\frac{y}{x}\right)=\log|x|+c$

(b) $y+\sqrt{x^2+y^2}=cx^2$ 5. $\sec\left(\frac{y}{x}\right)=cxy$

6. $y\log x=-\frac{2}{x}(1+\log x)+c$ 7. $y=\frac{1}{x}-\cot x+\frac{c}{x\sin x}$

8. $y=x^2-\frac{\pi^2}{4\sin x},\sin x\neq 0$ 9. $x=2y^2+cy$

10. $x=\left(\tan^{-1}y-1\right)+ce^{-\tan^{-1}y}$

(DAY -10 :- 29/10/2023)

VECTOR ALGEBRA

1.Write a vector of magnitude 15 units in the direction of vector $\hat{i}-2\hat{j}+2\hat{k}$.

2. .Find $\vec{a}.\vec{b}$ if $\vec{a}=3\hat{i}-\hat{j}+2\hat{k}$ and $\vec{b}=2\hat{i}+3\hat{j}+3\hat{k}$.

3. If $\vec{a}$ and $\vec{b}$ are two vectors such that $|\vec{a}.\vec{b}|=|\vec{a}\times\vec{b}|$, then what is the angle between $\vec{a}$ and $\vec{b}$

4. If $|\vec{a}|=3$, $|\vec{b}|=5$ and $\vec{a}.\vec{b}=9$. Find $|\vec{a}\times\vec{b}|$

5. The dot products of a vector with the vectors $\hat{i}-3\hat{j}$, $\hat{i}-2\hat{j}$ and $\hat{i}+\hat{j}+4\hat{k}$ are 0 , 5 and 8 respectively. Find the vector.

6. If $\vec{a}=2\hat{i}+2\hat{j}+3\hat{k}$, $\vec{b}=-\hat{i}+2\hat{j}+\hat{k}$ and $\vec{c}=3\hat{i}+\hat{j}$ are such that $\vec{a}+\square\vec{b}$ is

perpendicular to $\vec{c}$, find the value of $\square$.

7. If $|\vec{a}+\vec{b}|=|\vec{a}-\vec{b}|$, then find the angle between $\vec{a}$ and $\vec{b}$.

8. Let $\vec{a}$, $\vec{b}$, $\vec{c}$ be three vectors such that $|\vec{a}| = 3, |\vec{b}| = 4, |\vec{c}| = 5$ and each of them being perpendicular to the sum of the other two, find $|\vec{a} + \vec{b} + \vec{c}|$.

9. If with reference to the right handed system of mutually perpendicular unit vectors $\hat{i}, \hat{j}$ and $\hat{k}$,,$\vec{a}$ = $3\hat{i} - \hat{j}$, $\vec{\beta} = 2\hat{i} + \hat{j} - 3\hat{k}$ then express $\vec{\beta}$ in the form of $\vec{\beta}_1 + \vec{\beta}_2$, where $\vec{\beta}_1$ is parallel to $\vec{a}$ and $\vec{\beta}_2$ is perpendicular to $\vec{\alpha}$.

10. If $\vec{a} = 4\hat{i} + 5\hat{j} - \hat{k}, \vec{b} = \hat{i} - 4\hat{j} + 4\hat{k}, \vec{c} = 3\hat{i} + 4\hat{j} - \hat{k}$, then find a vector $\vec{d}$ perpendicular to both $\vec{c}$ and $\vec{b}$ and $\vec{d} \cdot \vec{a} = 21$

ANSWERS

1 5 ($\hat{i} - 2\hat{j} + 2\hat{k}$

2 . $\vec{a}$. $\vec{b}$ = 9 3. $\frac{\pi}{4}$ 4. 12

5. $15\hat{i} + 5\hat{j} - 3\hat{k}$ 6. 8 7. $\frac{\pi}{2}$ 8. $5\sqrt{2}$

9. $\vec{\beta}_1 = \frac{1}{2}(3\hat{i} - \hat{j})$, $\vec{\beta} = \frac{1}{2}\hat{i} + \frac{3}{2}\hat{j} - 3\hat{k}$ 10 $-\frac{1}{3}(\hat{i} - 16\hat{j} - 13\hat{k})$.