Mathematics form 3 questions and answers pdf full textbook class

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1. In each of the following cases, determine the direction cosines of the normal to the plane and the distance from the origin.

(a) $z = 2$ **(b) $x + y + z = 1$**

(c) $2x + 3y - z = 5$ **(d) $5y + 8 = 0$**

Sol. (a) **Given:** Equation of the plane is $z = 2$

Let us first reduce it to vector form $\vec{r} \cdot \vec{n} = d$ where $d > 0$

or $0x + 0y + 1z = 2$ (Here $d = 2 > 0$)

$\Rightarrow (x\hat{i} + y\hat{j} + z\hat{k}) \cdot (0\hat{i} + 0\hat{j} + \hat{k}) = 2$

$(\because a_1a_2 + b_1b_2 + c_1c_2 = (a_1\hat{i} + b_1\hat{j} + c_1\hat{k}) \cdot (a_2\hat{i} + b_2\hat{j} + c_2\hat{k}))$

$\Rightarrow \vec{r} \cdot \vec{n} = 2$ where we know that

$\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$ = (Position vector of point $P(x, y, z)$)

and here $\vec{n} = 0\hat{i} + 0\hat{j} + \hat{k}$

Now let us reduce $\vec{r} \cdot \vec{n} = d$ to $\vec{r} \cdot \hat{n} = p$

Dividing both sides by $|\vec{n}|$, $\dfrac{\vec{r} \cdot \vec{n}}{|\vec{n}|} = 2$

i.e., $\vec{r} \cdot \hat{n} = 2 = p$ where $\hat{n} = \dfrac{\vec{n}}{|\vec{n}|} = \dfrac{0\hat{i} + 0\hat{j} + \hat{k}}{\sqrt{0 + 0 + 1} = 1}$

i.e., $\hat{n} = 0\hat{i} + 0\hat{j} + \hat{k}$ and $p = 2$

$\therefore$ By definition, direction cosines of normal to the plane are coefficients of $\hat{i}, \hat{j}, \hat{k}$ in $\hat{n}$ *i.e.,* 0, 0, 1 and length of perpendicular from the origin to the plane is $p = 2$.

(b) **Given:** Equation of the plane is $x + y + z = 1$

$\Rightarrow 1x + 1y + 1z = 1$ (Here $d = 1 > 0$)

$\Rightarrow (x\hat{i} + y\hat{j} + z\hat{k}) \cdot (\hat{i} + \hat{j} + \hat{k}) = 1$

i.e., $\vec{r} \cdot \vec{n} = 1$ where $\vec{n} = \hat{i} + \hat{j} + \hat{k}$

Dividing both sides by $|\vec{n}| = \sqrt{1^2 + 1^2 + 1^2} = \sqrt{3}$, we have

$$\vec{r} \cdot \frac{\vec{n}}{|\vec{n}|} = \frac{1}{|\vec{n}|}$$

[$\because$ The lost card is a diamond, therefore, there are 12 diamond cards in the remaining pack of 51 cards]

and $$P(A/E_2) = \frac{^{13}C_2}{^{51}C_2} = \frac{\frac{13 \times 12}{2 \times 1}}{\frac{51 \times 50}{2 \times 1}} = \frac{156}{2550}$$

[$\because$ The lost card is not a diamond, therefore, there are 13 diamond cards in the remaining pack of 51 cards]

We have to find $P(E_1/A)$ *i.e.,* P(lost card is a diamond card given that the two cards drawn from the remaining pack of 51 cards are diamonds)

We know that

$$P(E_1/A) = \frac{P(E_1)\,P(A/E_1)}{P(E_1)\,P(A/E_1) + P(E_2)\,P(A/E_2)} \text{ (By Baye's Theorem)}$$

$$= \frac{\frac{1}{4} \times \frac{132}{2550}}{\frac{1}{4} \times \frac{132}{2550} + \frac{3}{4} \times \frac{156}{2550}}$$

Multiplying every term by 4×2550, $= \dfrac{132}{132 + 468} = \dfrac{132}{600} = \dfrac{11}{50}$.

13. Probability that A speaks truth is $\frac{4}{5}$. A coin is tossed. A reports that a head appears. The probability that actually there was head is

(A) $\frac{4}{5}$ **(B) $\frac{1}{2}$** **(C) $\frac{1}{5}$** **(D) $\frac{2}{5}$.**

Sol. Let event E_1: a head appears on a coin.

and $E_2 = E_1'$: a head does not appear

then E_1, E_2 are mutually exclusive and exhaustive events

$$P(E_1) = P(E_2) = \frac{1}{2}$$

Let event H: (Person) A **reports** that a head appears

Given: $P(H/E_1)$ = P(Person A reports that a head appears when actually there is head) = P(A speaks truth) = $\frac{4}{5}$

and hence $P(H/E_2)$ = P(A tells a lie) = $1 - \frac{4}{5} = \frac{1}{5}$

we have to find $P(E_1/H)$ = P(A head (actually) appears; reported that a head has appeared)

We know that

$$P(E_1/H) = \frac{P(E_1)\,P(H/E_1)}{P(E_1)\,P(H/E_1) + P(E_2)\,P(H/E_2)} \quad \text{(By Baye's Theorem)}$$

$= e^{6x}$ [– 3 . cos 3x . 3 – 6 sin 3x . 3] + (– 3 sin 3x + 6 cos 3x) e^{6x} . 6

$= e^{6x}$ (– 9 cos 3x – 18 sin 3x – 18 sin 3x + 36 cos 3x)

$= e^{6x}$ (27 cos 3x – 36 sin 3x)

$= 9e^{6x}$ (3 cos 3x – 4 sin 3x).

8. $\tan^{-1} x$.

Sol. Let $y = \tan^{-1} x$

$$\therefore \quad \frac{dy}{dx} = \frac{1}{1+x^2}$$

Again differentiating w.r.t. x,

$$\frac{d^2y}{dx^2} = \frac{d}{dx}\left(\frac{1}{1+x^2}\right) = \frac{(1+x^2)\frac{d}{dx}(1) - 1\frac{d}{dx}(1+x^2)}{(1+x^2)^2}$$

$$= \frac{(1+x^2)0-(2x)}{(1+x^2)^2} = \frac{-2x}{(1+x^2)^2}.$$

9. log (log x).

Sol. Let $y = \log(\log x)$

$$\therefore \quad \frac{dy}{dx} = \frac{1}{\log x}\frac{d}{dx}\log x \qquad \left[\because \frac{d}{dx}\log f(x) = \frac{1}{f(x)}\frac{d}{dx}f(x)\right]$$

$$= \frac{1}{\log x}\frac{1}{x} = \frac{1}{x\log x}$$

Again differentiating w.r.t. x,

$$\frac{d^2y}{dx^2} = \frac{(x\log x)\frac{d}{dx}(1) - 1\frac{d}{dx}(x\log x)}{(x\log x)^2}$$

$$= \frac{(x\log x)0 - \left[x\frac{d}{dx}\log x + \log x\frac{d}{dx}(x)\right]}{(x\log x)^2}$$

$$= -\frac{\left[x.\frac{1}{x} + \log x.1\right]}{(x\log x)^2} = -\frac{(1+\log x)}{(x\log x)^2}.$$

10. sin (log x).

Sol. Let $y = \sin(\log x)$

$$\therefore \quad \frac{dy}{dx} = \cos(\log x)\frac{d}{dx}(\log x) = \cos(\log x).\frac{1}{x}$$

$$= \frac{\cos(\log x)}{x}$$

Again differentiating w.r.t. x,

4. *The lengths of 40 leaves of a plant are measured correct to the nearest millimetre, and the data obtained is represented in the following table:*

Length (in mm)	*Number of leaves*
118-126	*3*
127-135	*5*
136-144	*9*
145-153	*12*
154-162	*5*
163-171	*4*
172-180	*2*

Find the median length of the leaves.

(**Hint:** *The data needs to be converted to continuous classes for finding the median, since the formula assumes continuous classes. The classes then change to 117.5-126.5, 126.5-135.5, ..., 171.5-180.5.*)

Sol. The data is not continuous, so we make the data continuous.

C.I.	*C.I.*	*f*	*cf*	
118-126	117.5-126.5	3	3	
127-135	126.5-135.5	5	8	
136-144	135.5-144.5	9	17	
145-153	144.5-153.5	12	29	← Median class
154-162	153.5-162.5	5	34	
163-171	162.5-171.5	4	38	
172-180	171.5-180.5	2	40	
		N = 40		

$\frac{N}{2} = \frac{40}{2} = 20$, we locate 20 in *cf* column.

Exerise 13.3

Unless stated otherwise, take $\pi = \dfrac{22}{7}$.

1. *A metallic sphere of radius 4.2 cm is melted and recast into the shape of a cylinder of radius 6 cm. Find the height of the cylinder.*

Sol. Radius of the sphere (r_1) = 4.2 cm

$\therefore$ Volume of the sphere $\left(\dfrac{4}{3}\pi r_1^3\right)$

$$= \frac{4}{3}\times\frac{22}{7}\times\frac{42}{10}\times\frac{42}{10}\times\frac{42}{10}\text{ cm}^3$$

Radius of the cylinder (r_2) = 6 cm

Let 'h' be the height of the cylinder

$\therefore$ Volume of the cylinder $= \pi r^2 h = \dfrac{22}{7}\times 6\times 6\times h\text{ cm}^3$

Since, Volume of the metallic sphere = Volume of the cylinder.

$$\Rightarrow\quad \frac{4}{3}\times\frac{22}{7}\times\frac{42}{10}\times\frac{42}{10}\times\frac{42}{10} = \frac{22}{7}\times 6\times 6\times h$$

$$\Rightarrow\quad h = \frac{4}{3}\times\frac{22}{7}\times\frac{42}{10}\times\frac{42}{10}\times\frac{42}{10}\times\frac{7}{22}\times\frac{1}{6}\times\frac{1}{6}\text{ cm}$$

$$= \frac{4\times7\times7\times4}{10\times10\times10}\text{ cm} = \frac{2744}{1000}\text{ cm} = \mathbf{2.744\ cm.}$$

2. *Metallic spheres of radii 6 cm, 8 cm and 10 cm, respectively, are melted to form a single solid sphere. Find the radius of the resulting sphere.*

APPLICATIONS (4) Conference, three hours; Discuse, an hour. Requirements: 32B, 33b. INTRODUCTION TO BASIC FILMS AND PROCEDURES OF COMPLEX ANALYSIS OF A RELEVANT VARIABLE FOR APPLICATIONS. The themes include cauchy/riemann equations, cauchy/riemann, The integral formula, the expansion of the power series, the contour integrals, the calculation of waste. The following schedule, with sections of textbooks and themes, is based on 26 conferences. The remaining meetings in the classroom are for manoeuvre, revisions and a midterm review. These are programmed by the individual instructor. Often there is a midterm review and review on the end of the fifth week of instruction, plus a review for the final review. Gamelin, à Complex Analysis, Springer/Verlag. The book is subject to change. Verify with the complex numbers of UCLA complexes.lectureSectureTopics Topics, polar shape, complex multiplication, roots of complex numbers (most of this is revision) Basic functions, including power, root, exponential, logarithm and trigonometric functions derived from complex, basic rules of the differentiation equations-riemann ; reverse functions; harmonic functions; conformality; Linear transformation line theorem of Green; Harmonic Conjugates of Complex Line. ML-estimation Mathematics 132H: analysis of the complex analysis course (honours), three hours; discussion, one hour. Requirements: 32B, 33B and 131A courses with B or better grades. This course is designed [illegible]

[illegible]

... and additional properties of the Fourier series, at the discretion of the instructor. Some suggestions: suggestions: [illegible]

[illegible] Transformations of Laplace. Examples of transformation pairs. The transformation of Laplace from a differential equation. The use of the Laplace transformations for the solution of initial value problems. Computer of Laplace's reverse transformation. Resisted partial fraction explosions1. Existence and singularity of the transformation functions of Laplace. Sectionally continuous functions. Exponentially limited functions. PROPERTY of the theorem of convolution. Heaviside's expansion theorem2. The function of Heaviside and Dirac Distribution. Drive-in response functions. Use of the drive response function. Existence and theory of singularity. Examples of differential equations without unique solutions or global solutions. Status of Lipschitz; Determination of Lipschitz constants. Status of a global existence and theorem of singularity: when f (x, and) is Lipschitz in [A, B] × [-8, 8] 4. Examples of the application of existence and theorem of singularity. Preliminary Test; Maximum Standard, Uniform Convergence, Weierstrauss M Test. Equivalence of differential equation to a comprehensive equation 5. iteration of peak. Evidence of existence and singularity. Local existence and theorems of singularity. Applications of local existence and theorems of singularity. Regular functions and Fourier series. Insufficient approaches to the power series for periodic functions. Fourier series coefficient formulas. Examples of Fourier series. Loss of coefficient formulas from the Fourier series. Fourier series for periodic functions at arbitrary intervals. Internal productsOrthogonal functions. Derivation of coefficients of the Fourier series using internal products. Conversation theorems for the Fourier series: Punctual convergence. Conversation theorems for Fourier series: L2 L2 ######

[illegible] equation in the real line. The maximum principle and singularity of Dirichlet's problem for heat equation. The heat core and the solution of the initial value problem for the heat equation in the real line. The softening property of the heat flow and the comparison of the main properties of the wave and heat equations. The heat equation in the middle line. Dirichlet and Neumann's boundary conditions. The method of reflection. The wave equation in the middle line. Waves reflected. (The first part of section 3.2). Non-homogeneous heat equation in the real line. The non-homogeneous wave equation in the real line and the operator method. Principle of Duhamel. Section 3.4: The theorem 1 test using the operator method) Check before the spectral methods of the half. For limit problems in finite intervals. Separation of variables and wave equation with Dirichlet limit conditions. The own values and functions within a limited interval with Dirichlet limit conditions. The heat equation with Dirichlet contour conditions. Formal expressions of own functions. Neumann's limit conditions for wave and heat equations. The own values and functions of a limited interval with Neumann limit conditions. The values themselves and their own in an interval coupled with robotin limit conditions: a cheesy discussion. Four-year series and Fourier coefficients of periodic functions in real and complex form. Fourier series explosions for functions defined in an interval of form through pairs and strange extensions. From and sewing expansions. Examples. Symmetric boundary conditions and orthogonality of the functions of its own. Theorems of convergence for the Fourier series, the notions of uniform and the convergence L^2. The less square approach, thefrom Bessel and the identity of Parseval. A word about the punctual convergence of the Fourier series. The Laplace equation and armed functions. The most maximum principle The uniqueness of the Dirichlet problem. The Laplace operator in polar coordinates and the Newtonian potential in 2D and 3D. The Laplace equation and separation of variables in a rectance. (Section 6.2, can be omitted due to time limitations). Dirichlet's problem on the album and Poisson's formula. The medium value property for armed functions and its differentiability properties. Mathematics 142: Mathematical modeling course described, three hours; Discuse, an hour. Prerequisites: 32b courses, 33b. Introduction to the fundamental principles and spirit of the applied mathematics. Emphasis on the way in which mathematical models are constructed for physical problems. Illustrations of many fields of effort, such as physical sciences, biology, economics and the dynamic of trilimic. Haberman, R., Mathematical Models, Society for Industrial and Applied Mathematics. Mathematics 146: All of description of the mathematical course applied, three hours; Discuse, an hour. Prerequisite: 32b courses, 33b. Comprehensive equations, function of Green and cages of variations. Selected Applications of the Control Theory, theptics, dynamic systems and other engineering problems. Troutman, J., Variational cug and optimal control: optimization with elementary convexity, 2nd ed., Springer. MATHEMATICS 151A: All applied description applied (4) Conference, three hours; Discuse, an hour. REQUIREMENTS: COURSES 32B, 33B, 115A, 10A COMPUTATION PROGRAM. Introduction to all numã © rich with algorithms, algorithms annoysm and computer implementation problems. Solution of non -linear equations. Numerical differentiation, integration and interpolation. All directly to solve linear systems. MATLAB programming. Classification letter. R. Burden and J. Faires, Numerical analysis, 10th ed., Brooks/Cole. [illegible]

[illegible]

Math 155: Mathematical Imaging Course Description(4) Lecture, three hours; discussion, one hour. Requisites: courses 32B, 33B, 115A, Program in Computing 10A. Imaging geometry. Image transforms. Enhancement, restoration, and segmentation. [illegible]

[illegible]

Math 170 is an introduction to the statistics. The themes include sampling, estimation and estimator properties; Construction of trust intervals and hypothesis tests. It is designed to meet the requirements of the Society of Acuaries for mathematical statistics. Classification letter. HOGG, Tanis, Probability of Zimmerman and Statistic Inference (10th Edition) Lecture The Explorar Data Annial Data Analysis MAXIMUM Estimation of the probability. Term 1 on Chapters 6 and 7Tees of two media equality of a statistical test of the goodness of the fiction of Chi-Square ANALYSIS OF THE VARIATION OF TWO VAS Stochastic description of the course (Formerly Numbered 151) Lecture, three hours; Discuse, an hour. REQUIREMENTS: COURSES 33A, 170A OR STATISTICS 100A. Discreet Markov chains, continuous time Markov chains, renewal theory. P/NP or card classification. Mathematics 174e: Mathematics of finance for mathematics/economics students of economy description of the course (approximately numbered 174). Conference, three hours; Discuse, an hour. Reinforced requirements: 33A and 170e courses (or mathematics 170a or 100A statistics). It is not open for the child to students with a crop by course 174a, Economy 141, or C183/C283 statistics. Mathematical modeling of financial values in discreet and continuous time. Forward, futures, Swaps, uses and prices (models of ongoing and black-scholes) of European and American options, Greeks and all numã © rich. P/NP or card classification. Hull, John C., options, futures and all other derivatives, 9th edition [illegible]

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Expected value and variance. Standard and regular deviation and determining the exchange rate. Case of constant notional amount, net payments. Advanced analysis of weeks problems 6-8. Advanced problems of problems of 6-8. Derivative weeks, dividend stock, short sale of shares, capital investments, financial derivatives. Description of the course (4) Conference, three hours; Discuse, an hour. Requirement: course 32b, 175 or 177, 170a or 170e or 100A statistics. An introductory course on mathematics associated with long -term insurance coverage. Individual and multiple survival models, annuities, premiums and policy values, reserves, pension plans and retirement benefits. Classification letter. A basic sequence course for major financial actuarial mathematics, mathematics 178a and the first half of the mathematics 178B cover the program of the Actuaries Society (SOA) Actuarial examination in the long term (LTAM). At the end of this course, students may value and establish premiums for insurance instruments of numerous types using traditional actuarial models. The type of life contingency models that are used in the cycles will also understand. Dickson, David C.M., Hardy, Mary R. and Waters, Howard R, actuarial mathematics for the contingent risks of life. Cambridge University Press, 2013. SECTURESECTICIPOPICSLIFE INSURANCE AND ANNUITY CONTRACTS, PENSION BENEFITS, MUTUAL AND PROPERY INSURERS. [illegible]

[illegible]

Math 195: Community Internships in Mathematics Education Course DescriptionTutorial, to be arranged. Limited to juniors/seniors. Internship to be supervised by Center for Community Learning and Mathematics Department. Students meet on a regular basis with instructor, provide periodic reports of their experience, have assigned readings on mathematics education, and complete final paper. The final paper is a substantial part of the course, and will require a significant investment of time during the quarter. May not be repeated and may not be applied toward major requirements. Individual contract with supervising faculty member required. P/NP grading. Math 197: Individual Studies in Mathematics Course Description(2 to 4 units). Tutorial, three hours per week per unit. Limited to juniors/seniors. At discretion of chair and subject to availability of staff, individual intensive study of topics suitable for undergraduate course credit but not specifically offered as separate courses. Scheduled meetings to be arranged between faculty member and student. Assigned reading and tangible evidence of mastery of subject matter required. May be repeated for maximum of 12 units, but no more than one 197 or 199 course may be applied toward upper division courses required for majors offered by Mathematics Department. Individual contract required. P/NP or letter grading. Math 199: Directed Research or Senior Project in Mathematics Course Description(2 or 4 units). Tutorial, three hours per week per unit. Limited to juniors/seniors. Supervised individual research under guidance of faculty mentor. Scheduled meetings to be arranged between faculty member and student. Culminating report required. May be repeated for maximum of 12 units, but no more than one 197 or 199 course may be applied toward upper division courses. For specialties offered by the math department. Individual contract is required. P/NP or lyric classification.

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