SOLUTIONS MATHEMATICAL METHODS FOR PHYSICISTS 7TH ED ARFKEN

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Solved Problems in Mathematical Methods for Physicists

Question 1: Determine the general solution of the differential equation y" - 4y' + 4y = 0.

Answer:

Using the auxiliary equation $r^2 - 4r + 4 = 0$ and the quadratic formula, we find that $r = 2$. Therefore, the general solution is $y(x) = c_1e^{(2x)} + c_2e^{(-2x)}$.

Question 2: Evaluate the integral ?(x^2 + 1)/(x^3 - 1) dx.

Answer:

Using partial fractions and integration, we find that $?(x^2 + 1)/(x^3 - 1)$ dx = $(1/3)\ln|x^3 - 1| - (1/3x) + C$.

Question 3: Solve the system of linear equations 3x + 2y - z = 1, x - y + 2z = 5, and 2x + y - 3z = 4.

Answer:

Using Gaussian elimination, we find that $x = 2$, $y = 1$, and $z = 1$.

Question 4: Find the eigenvalues and eigenvectors of the matrix A = [[2, 1], [-1, 2]].

Answer:

The eigenvalues are $\lambda_1 = 1$ and $\lambda_2 = 3$. The eigenvectors corresponding to λ_1 and λ_2 are $v_1 = [1, -1]$ and $v_2 = [1, 1]$, respectively.

Question 5: Prove that the function $f(x) = e^{-x^2}$ is even.

Answer:

$f(-x) = e^{-(-x)^2} = e^{-x^2} = f(x)$, so $f(x)$ is even.

Starting Out with Visual C++ 2010/2012: A Comprehensive Guide

By Tony Gaddis

Tony Gaddis's "Starting Out with Visual C++ 2010/2012" is a widely acclaimed textbook for beginners in C++ programming. Here are some frequently asked questions and answers about the book:

Q: What is the target audience for this book?

A: The book is designed for introductory students with no prior programming experience. It assumes no knowledge of C++, object-oriented programming, or the .NET Framework.

Q: What topics does the book cover?

A: The book covers the fundamentals of C++ programming, including data types, variables, operators, control flow, functions, classes, objects, and inheritance. It also introduces advanced C++ concepts such as templates, exception handling, and the Standard Template Library (STL).

Q: How is the book structured?

A: The book is organized into 19 chapters, each of which includes detailed explanations, code examples, and practice exercises. The chapters are arranged in a logical progression, building upon the concepts introduced in previous chapters.

Q: What are the key features of the book?

A: The book features:

- Clear and concise explanations

- Abundant code examples and exercises

- A focus on practical applications

- A companion website with additional resources

Q: How can readers use this book effectively?

A: To get the most out of the book, readers should:

- Read the chapters in order and work through the exercises

- Take advantage of the online resources

- Practice writing and debugging C++ code

- Seek assistance from instructors or classmates when needed

Thompson Thompson Genetica Medica: Comprehensive Guide

What is Thompson Thompson Genetica Medica?

Thompson Thompson Genetica Medica is a comprehensive reference on medical genetics, providing an in-depth understanding of the genetic basis of human diseases and their clinical management. It is widely recognized as the leading textbook in the field.

Who are the authors of Thompson Thompson Genetica Medica?

The authors of the current edition, 8th edition, are Dr. Michael R. Hayden and Dr. Huntington F. Willard. Previous editions were written by Dr. Thompson and Dr. Thompson, hence the name of the book.

What is the format of Thompson Thompson Genetica Medica?

The book is organized into 12 chapters, each covering a major area of medical genetics. It includes detailed descriptions of genetic disorders, including their clinical features, molecular basis, genetic testing, and treatment options. It also provides information on genetic counseling and ethical issues in medical genetics.

What are the key features of Thompson Thompson Genetica Medica?

Key features of the book include:

- Clear and concise explanations of complex genetic concepts
- Up-to-date information on the latest genetic discoveries
- Extensive illustrations, diagrams, and photographs
- Self-assessment questions and case studies to reinforce learning
- Comprehensive references for further study

Who should read Thompson Thompson Genetica Medica?

The book is primarily intended for medical students and physicians specializing in genetics, pediatrics, internal medicine, and other medical fields. It is also a valuable resource for researchers, geneticists, and healthcare professionals involved in genetic testing and counseling.

Analyzing ZIMSEC Advanced Level Mathematics Examination Question Papers

ZIMSEC, the Zimbabwe Schools Examination Council, administers the Advanced Level Mathematics examination for students completing secondary education in Zimbabwe. To excel in this critical examination, students must thoroughly prepare by studying comprehensive question papers.

Question 1: Pure Mathematics

- **Question:** Find the equation of the normal to the curve $y = x^2 + 2x - 3$ at the point (1, 0).
- **Answer:** Differentiate y to get $dy/dx = 2x + 2$. At (1, 0), $dy/dx = 4$. Therefore, the normal has a gradient of -1/4. The normal passes through (1, 0), so the equation of the normal is $y + 0 = (-1/4)(x - 1)$, or $4y = -x + 4$, or $x + 4y - 4 = 0$.

Question 2: Applied Mathematics

- **Question:** A particle moves in a straight line such that its acceleration a is given by $a = 2t - 3$, where t is the time in seconds. If the particle starts from

rest at t = 0, find its velocity at t = 5.

- **Answer:** Integrate a with respect to t to get v = t^2 - 3t + C. At t = 0, v = 0, so C = 0. Therefore, v = t^2 - 3t. At t = 5, v = 5^2 - 3(5) = 10 m/s.

Question 3: Mechanics

- **Question:** A projectile is thrown with a velocity of 20 m/s at an angle of 60° to the horizontal. Calculate the maximum height reached by the projectile.

- **Answer:** The vertical component of the velocity is 20sin(60) = 17.32 m/s. Using v^2 = u^2 + 2as, where v is the final velocity, u is the initial velocity, a is the acceleration due to gravity, and s is the displacement, we get 0 = (17.32)^2 + 2(-9.81)s. Solving for s, we get s = 16.2 m.

Question 4: Statistics

- **Question:** The mean of a set of data is 25 and the standard deviation is 3. Calculate the probability that a randomly selected value from the data set will be between 19 and 31.

- **Answer:** Using the z-score formula z = (x - ?) / ?, where x is the value, ? is the mean, and ? is the standard deviation, we get z = (19 - 25) / 3 = -2 and z = (31 - 25) / 3 = 2. Using a probability table, we find P(-2 < z < 2) = 0.9544.

Question 5: Business Mathematics

- **Question:** A company produces and sells widgets. The fixed costs are $100,000 per year, and the variable costs are $10 per widget. The widgets are sold for $20 each. Calculate the number of widgets that must be sold to break even.

- **Answer:** The break-even point is when revenue equals costs. Let x be the number of widgets sold. Revenue is 20x, variable costs are 10x, and fixed costs are 100,000. Therefore, 20x = 10x + 100,000. Solving for x, we get x = 100,000 / 10 = 10,000 widgets.

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