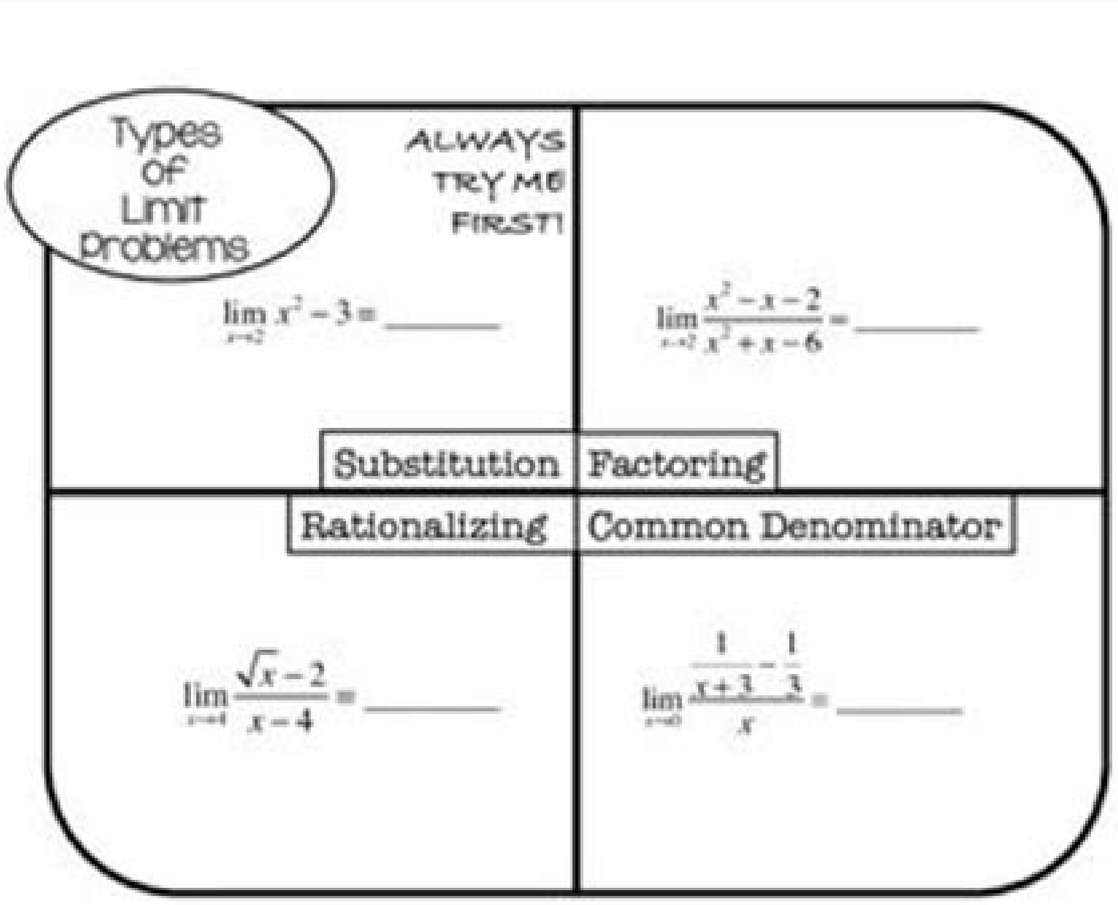
Ap calculus ab limit worksheet

Continue

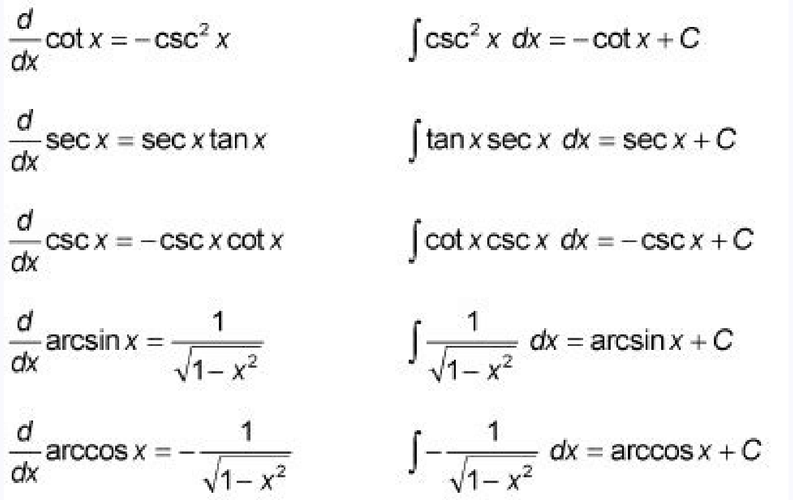


Name Date

SUBTRACTION PROBLEMS TO 20 SHEET 3

		WORKING OUT
1)	Sally buys 17 . She eats 13 . How many are left? _____	
2)	There are 19 in a parking lot. 8 drive away. What is 19 minus 8? _____	
3)	Captain finds 18 . Frazer finds 9 . What is the difference?	

Derivative	Integral (Antiderivative)
$\frac{d}{dx} n = 0$	$\int 0 \, dx = C$
$\frac{d}{dx} x = 1$	$\int 1 \, dx = x + C$
$\frac{d}{dx} x^n = nx^{n-1}$	$\int x^n \, dx = \frac{x^{n+1}}{n+1} + C$
$\frac{d}{dx} e^x = e^x$	$\int e^x \, dx = e^x + C$
$\frac{d}{dx} \ln x = \frac{1}{x}$	$\int \frac{1}{x} \, dx = \ln x + C$
$\frac{d}{dx} n^x = n^x \ln x$	$\int n^x \, dx = \frac{n^x}{\ln n} + C$
$\frac{d}{dx} \sin x = \cos x$	$\int \cos x \, dx = \sin x + C$
$\frac{d}{dx} \cos x = -\sin x$	$\int \sin x \, dx = -\cos x + C$
$\frac{d}{dx} \tan x = \sec^2 x$	$\int \sec^2 x \, dx = \tan x + C$
$\frac{d}{dx} \cot x = -\csc^2 x$	$\int \csc^2 x \, dx = -\cot x + C$
$\frac{d}{dx} \sec x = \sec x \tan x$	$\int \tan x \sec x \, dx = \sec x + C$
$\frac{d}{dx} \csc x = -\csc x \cot x$	$\int \cot x \csc x \, dx = -\csc x + C$
$\frac{d}{dx} \arcsin x = \frac{1}{\sqrt{1-x^2}}$	$\int \frac{1}{\sqrt{1-x^2}} \, dx = \arcsin x + C$
$\frac{d}{dx} \arccos x = -\frac{1}{\sqrt{1-x^2}}$	$\int -\frac{1}{\sqrt{1-x^2}} \, dx = \arccos x + C$
$\frac{d}{dx} \arctan x = \frac{1}{1+x^2}$	$\int \frac{1}{1+x^2} \, dx = \arctan x + C$
$\frac{d}{dx} \operatorname{arc\,cot} x = -\frac{1}{1+x^2}$	$\int -\frac{1}{1+x^2} \, dx = \operatorname{arc\,cot} x + C$
$\frac{d}{dx} \operatorname{arc\,sec} x = \frac{1}{x\sqrt{x^2-1}}$	$\int \frac{1}{x\sqrt{x^2-1}} \, dx = \operatorname{arc\,sec} x + C$
$\frac{d}{dx} \operatorname{arc\,csc} x = -\frac{1}{x\sqrt{x^2-1}}$	$\int -\frac{1}{x\sqrt{x^2-1}} \, dx = \operatorname{arc\,csc} x + C$



Loading... LectureSectionTopicsIntroduction and Basic Principles of ModelingDiscrete Dynamical SystemsDiscrete Stochastic ModelsStages, States, and ClassesContinuous Dynamical SystemsContinuous Dynamical Systems (continued) and Related TopicsContinuous Stochastic ModelsMathematical Contest in Modeling: Student Discussions and Projects Math 61: Introduction to Discrete Structures Course Description(4) Lecture, three hours; discussion, one hour. Requisites: courses 31A, 31B. Not open for credit to students with credit for course 180 or 184. Discrete structures commonly used in computer science and mathematics, including sets and relations, permutations and combinations, graphs and trees, induction. P/NP or letter grading.The following schedule, with textbook sections and topics, is based on 26 lectures. The remaining classroom meetings are for two midterm exams and review. These are scheduled by the individual instructor. Often there are midterm exams about the beginning of the fourth and eighth weeks of instruction.R. Johnsonbaugh, Discrete Mathematics (8th Edition) , Prentice-Hall.LectureSectionTopicsEquivalence relations, matrices of relationsBasic counting principlesPermutations and combinationsGeneralized permutations and combinationsSolving recurrence relations (including material in exercises 40-46)Decision trees, sorting (including merge sort from 7.3) Math 70: Introduction to Probability Course Description(4) Lecutre, 3 hours; Discussion, 1 hour. Requisites: courses 31A, 31B. Introduction to probability through applications and examples. Topics include laws of large numbers, statistics, chance trees, conditional probability, Bayes? rule, continuous and discrete random variables, jointly distributed random variables, multivariate normal and conditional distributions. In depth discussion of betting schemes in gambling, occurrence of rare events, coincidences and statistical predictions. P/NP or letter grading.The course introduces a list of standard probabilistic problems and analyzes them in detail within the formalism of probability as a mathematical discipline. At the end of the course, the students will be able to demonstrate their understanding of the foundations and basic facts of probability as a mathematical discipline and apply them to resolve questions with probabilistic content.Tijms, H. Understanding Probability, Chance Rules in Everyday Life, 3rd Edition. Cambridge University Press, 2012LectureSectionTopicsLaws of large numbers and simulationProbability in everyday life and rare eventsProbability and statistics, chance treesFoundations of probabilityConditional probability and Bayes? RuleDiscrete random variablesContinuous random variablesJointly distributed random variablesConditional distributions Math 73XP: Key Issues in K-12 Mathematics Course Description(3) Seminar, two hours; fieldwork (classroom observation and participation), two hours. Introduce students to K-12 mathematics activity in the United States. Cultivate interest in teaching through exploration of the sequences of mathematical content and habits of mind taught in these grades. Analyze sequences of topics in the current California State Standards in Mathematics (CCSS-M), the mathematical structures that underlie these sequences and cognitive aspects of learning mathematics. Experience with professional mathematician?s habits of mind outlined in the California Standards for Mathematical Practice (including proof and mathematical modeling) and effective strategies for teaching mathematics to diverse student groups. Fieldwork in local mathematics classrooms arranged by Cal Teach program. P/NP (undergraduates) or S/U (graduates) grading.National Research Counci How Students Learn: Mathematics in the Classroom. Washington, DC: The National Academies Press (, 2005.Other reading materials to be providedOnline Resources:National Governors Association & Council of Chief State School Officers Common Core State Standards for Mathematics (, 2010.LectureSectionTopicsGrades 1-3: Length (CCSS-M 1.MD.2, 2.MD.3, 3.MD.4)Grades 3-5: Area & Volume Defined (CCSS-M 3.MD.5 – 7, 5.MD.3 – 5)Fieldwork Prompt: In what ways (if any) did you observe students engaging in CCSS SMP 1 in the classroom?Grades 6-8: Deriving Area and Volume Formulas (CCSS-M 6.G., 7.G.4, 8.G.9)Fieldwork Prompt: In what ways (if any) did you observe students engaging in CCSS SMP 2 in the classroom? Grades 9-12: Areas and Volumes of Irregular Regions and Solids (CCSS-M G.GMD.1)Fieldwork Prompt: In what ways (if any) did you observe students engaging in CCSS SMP 3 in the classroom?Grades K-2: Decomposing Shapes (CCSS-M K.G.6, 1.G.3, 2.G.3)Fieldwork Prompt: In what ways (if any) did you observe students engaging in CCSS SMP 4 in the classroom?Grades 3-5: Defining Fraction as a Number (CCSS-M 3.NF.1 & 2)Fieldwork Prompt: In what ways (if any) did you observe students engaging in CCSS SMP 5 in the classroom?Student Presentation of Performance TasksFieldwork Prompt: In what ways (if any) did you observe students engaging in CCSS SMP 6 in the classroom?Grades 3-5: Multiplying Fractions (CCSS-M 5.NF.4)Fieldwork Prompt: In what ways (if any) did you observe students engaging in CCSS SMP 7 in the classroom?Grades 6-7: Ratios and Proportional Relationships (CCSS-M 6.RP.3, 7.RP.2)Fieldwork Prompt: In what ways (if any) did you observe students engaging in CCSS SMP 8 in the classroom?Grades 8-12: Linear and Other Functions (CCSS-M 6.EE.9, 8.EE.5, 8.F.3, F.IF.1) Math 74XP: Mathematics and Pedagogy for Teaching Elementary Mathematics Course Description(3) (Formerly numbered Mathematics 71SL.) Seminar, two hours; fieldwork (classroom observation and participation), two hours. Facilitate development of professional mathematical and pedagogical understandings required to teach California?s K-5 mathematics curriculum. Exploration of K-5 mathematics, practice effective teaching strategies for all learners, and discuss current research and standards in math education. Fieldwork in local mathematics classrooms (observation and presenting lesson plan) arranged by Cal Teach program. P/NP (undergraduates) or S/U (graduates) grading.Berlinghoff & Gouvea Math Through The Ages: A Gentle History for Teachers and Others. Oxton Publishers & MAA, 2015.Other reading materials to be providedLectureSectionTopicsGrades K-2: Connecting Counting to Cardinality (CCSS-M K.CC.4)Grades K-2: The Base Ten System (CCSS-M 1.NBT.2, 2.NBT.1)Fieldwork Prompt: In what ways (if any) did you observe students engaging in CCSS SMP 1 in the classroom?Grades K-2: The Addition & Subtraction Algorithm (CCSS-M 2.NBT.9, 3.NBT.2)Fieldwork Prompt: In what ways (if any) did you observe students engaging in CCSS SMP 2 in the classroom?Grades 3-5: Adding and Subtracting Fractions (CCSS-M 4.NF.3)Fieldwork Prompt: In what ways (if any) did you observe students engaging in CCSS SMP 3 in the classroom?Grades 3-5: Relating Area to Multiplication (CCSS-M 3.MD.5-7)Fieldwork Prompt: In what ways (if any) did you observe students engaging in CCSS SMP 4 in the classroom?Grades 3-5: The Multiplication Algorithm for Whole Numbers (CCSS-M 4.NBT.5, 5.NBT.5)Fieldwork Prompt: In what ways (if any) did you observe students engaging in CCSS SMP 5 in the classroom?Grades 3-5: Student Presentations of Lesson PlansFieldwork Prompt: In what ways (if any) did you observe students engaging in CCSS SMP 6 in the classroom?Grades 3-5: Multiplying Fractions (CCSS-M 5.NF.4)Fieldwork Prompt: In what ways (if any) did you observe students engaging in CCSS SMP 7 in the classroom?Grades 3-5: Dividing Fractions (CCSS-M 5.NF.7)Fieldwork Prompt: In what ways (if any) did you observe students engaging in CCSS SMP 8 in the classroom?Grades 3-5: Decimals & Decimal Operations (CCSS-M 4.NF.5-7, 5.NBT.7, 6.NS.3) Math 89HC: Honors Contracts Course Description(1) Tutorial, three hours. Limited to students in College Honors Program. Designed as adjunct to lower-division lecture course. Individual study with lecture course instructor to explore topics in greater depth through supplemental readings, papers, or other activities. May be repeated for maximum of 4 units. Individual honors contract required. Honors content noted on transcript. Letter grading. Math 100: Problem Solving Course Description(4) (Formerly numbered 192.) Lecture, three hours. Requisite: course 31B with grade of C- or better. Problem-solving techniques and mathematical topics useful as preparation for Putnam Examination and similar competitions. Continued fractions, inequalities, modular arithmetic, closed form evaluation of sums and products, problems in geometry, rational functions and polynomials, other nonroutine problems. Participants expected to take Putnam Examination. P/NP grading.Problem-Solving Through Problems by Loren C. LarsonLectureSectionTopicsInduction. Generalized induction. The pigeonhole principle.Inequalities (AM-GM, weighted AM-GM, Cauchy-Schwartz, Jensen, Holder, Minkowski).Number theory. Modular arithmetic. Fermat’s little theorem, Euler’s theorem. The Chinese remainder theorem.Algebra. Polynomials (factorization over different fields, Viete’s relations). Some abstract algebra (groups, rings).Summation of series. Geometric progressions. Telescoping series and products. Taylor series.Combinatorics. Binomial coefficients and combinatorial identities.Recurent sequences (linear recurrences, generating functions). Discrete and continuous probability.Geometry problems. Elementary methods. Analytic geometry, conics. Vectors and complex numbers.Differential calculus. The extreme value theorem and the mean value theorem. Functional equations.Integral calculus. Approximating integrals by Riemann sums. Integral functional equations. Math 101: Advanced Problem Solving Course Description(4) Lecture, three hours. Prerequisite: Math 100 or significant experience with mathematical competitions. Advanced problem solving techniques and mathematical topics useful as preparation for Putnam Competition. Problems in abstract algebra, linear algebra, number theory, combinatorics, probability, real and complex analysis, differential equations, Fourier analysis. Regular practice tests given, similar in difficulty to the Putnam Competition. Enrollment is by permission of the instructor, based on a selection test or past Putnam results. May be repeated for maximum of 12 units. P/NP or letter grading.R. Gelca & T. Andreescu. Putnam and Beynd, Springer VerlagLectureSectionTopicsIntroduction to the Putnam Mathematical Competition. Selected test problems from previous years.Methods of proof: contradiction, induction, the pigeonhole principle, invariants.Algebra. Inequalities and identities. Real and complex polynomials.Linear Algebra. Eigenvalues, the Cayley-Hamilton Theorem. Abstract algebra (groups, rings).Geometry and trigonometry. Using vectors and complex numbers to solve gemetry problems.Number theory. Euler’s theorem. Diophantine equations.Combinatorics and combinatorial geometry. Generating functions. Probability.Real analysis problems. Sequences, series, continuity, derivatives and integrals. Convexity.Multivariable differential and integral calculus. Solving integrals using complex analysis.Differential equations and Fourier analysis. Math 103A: Observation and Participation: Mathematics Instruction Course Description(2) (Formerly Math 330.) Seminar, one hour; fieldwork (classroom observation and participation), two hours. Requisites: courses 31A, 31B, 32A, 33A, 33B. Course 103A is enforced requisite to 103B, which is enforced requisite to 103C. Observation, participation, or tutoring in mathematics classes at middle school and secondary levels. May be repeated for credit. P/NP (undergraduates) or S/U (graduates) grading. Math 103B: Observation and Participation: Mathematics Instruction Course Description(2) (Formerly Math 330.) Seminar, one hour; fieldwork (classroom observation and participation), two hours. Requisites: courses 31A, 31B, 32A, 33A, 33B. Course 103A is enforced requisite to 103B, which is enforced requisite to 103C. Observation, participation, or tutoring in mathematics classes at middle school and secondary levels. May be repeated for credit. P/NP (undergraduates) or S/U (graduates) grading. Math 103C: Observation and Participation: Mathematics Instruction Course Description(2) (Formerly Math 330.) Seminar, one hour; fieldwork (classroom observation and participation), two hours. Requisites: courses 31A, 31B, 32A, 32B, 33A, 33B. Course 103A is an enforced requisite to 103B, which is enforced requisite to 103C. Observation, participation, or tutoring in mathematics classes at middle school and secondary levels. May be repeated for credit. P/NP (undergraduates) or S/U (graduates) grading. Math 105A: Mathematics and Pedagogy for Teaching Secondary Mathematics Course Description(4) Lecture, four hours; fieldwork, 30 minutes. Requisites: courses 110A (or 117), 120A (or 123), and 131A, with grades of C- or better. Course 105A is requisite to 105B, which is requisite to 105C. Mathematical knowledge and research-based pedagogy needed for teaching key geometry topics in secondary school, including axiomatic systems, measure, and geometric transformations. Introduction to professional standards and current research for teaching secondary school mathematics. Letter grading.LectureSectionTopicsIntro to Problem Analysis; intro to definitionNumber: integers ? history and algebraic structure; comparing methods for teaching (-a)(-b) = +abNumber: rationals ? definition and algebraic structure; comparing models for rational divisionNumber: reals ? decimals, irrationals, countability; method for teaching rational operationsAttendance at all day Texas Instruments PTENumber: complex ? polar, rectangular, and exponential representations and their advantages, De Moivre?s Theorem; model lesson to introduce iNumber: complex ? stereographic projection; model lesson on modeling probabilistic data with linear functionsFunction: definitions; model lesson on modeling probabilistic data with exponential functionsJoint Meeting with the science team: modeling one dimensional motion with linear and quadratic functionsFunction: model lesson on maximum box volume problem; review for final Math 105B: Mathematics and Pedagogy for Teaching Secondary Mathematics Course Description(4) Lecture, four hours; fieldwork, 30 minutes. Requisites: courses 105A, 110A (or 117), 120A (or 123), and 131A, with grades of C- or better. Mathematical knowledge and research-based pedagogy needed for teaching key polynomial, rational, and transcendental functions and related equations in secondary school; professional standards and current research for teaching secondary school mathematics. Letter grading.LectureSectionTopicsFunction: rational functions; def. of asymptotes; formative assessment in the classroomEquation: preservation of solution sets; comparing strategies for teaching solving linear equationsEquation: preservation of solution sets; comparing strategies for teaching binomial multiplicationEquation: comparing methods for teaching factoring; the quadratic formula; solving the cubicAxiomatic Systems: intro to Euclid; a model secondary lesson on developing the concept of axiomAxiomatic Systems: a model secondary lesson on the triangle sum theorem in spherical geometryAxiomatic Systems: the triangle sum theorem in the hyperbolic geometryMeasure: definition of area; evaluating student work on intro to integral project; model lesson to develop elementary polygon areasAttendance at day long UCLA Mathematics and Teaching ConferenceAttendance at annual UCLA California Math Teacher Program Reunion Dinner Math 105C: Mathematics and Pedagogy for Teaching Secondary Mathematics Course Description(4) Lecture, four hours; fieldwork, 30 minutes. Requisites: courses 105A, 105B, 110A (or 117), 120A (or 123), and 131A, with grades of C- or better. Mathematical knowledge and research-based pedagogy needed for teaching key analysis, probability, and statistics topics in secondary school; professional standards and current research for teaching secondary school mathematics. Letter grading.LectureSectionTopicsMore on Measure: Area: Pythagorean Theorem. Measure: VolumeStudent Presentations of Lesson PlanStudent Presentations of Lesson Plan. Transformations: Symmetries.Transformations: Congruence and Similarity. Transformations: in the Cartesian plane.Trigonometry: Circular functions, similarity. Trigonometry and complex numbers.Probability: finite. Probability: geometric.Student Presentations of videotaped teachingStudent Presentations of math paper Math 106: History of Mathematics Course Description(4) Lecture, three hours; discussion, one hour. Requisites: courses 31A, 31B, 32A. Roots of modern mathematics in ancient Babylonia and Greece, including place value number systems and proof. Development of algebra through Middle Ages to Fermat and Abel, invention of analytic geometry and calculus. Selected topics. P/NP or letter grading.Stillwell, J., Mathematics and its History, 3rd Ed., Springer. Math 110AH: Algebra (Honors) Course Description(4) Lecture, three hours; discussion, one hour. Requisite: course 115A. Not open for credit to students with credit for course 117. Ring of integers, integral domains, fields, polynomial domains, unique factorization. Honors sequence parallel to courses 110A. P/NP or letter grading.The following schedule anticipates 24 days of instruction, with 2 holidays and 4 days for exams and reviews. If there is extra time, one could do section 6.3 – the structure of R/I when I is prime or maximal and/or section 4.6 – irreducibility in R[x] or C[x].R. Elman, Lectures on Abstract AlgebraBook is Subject to Change Without NoticeLectureSectionTopicsThe Integers: Well ordering and greatest common divisors.Equivalence relations, modular arithmeticGroups: Definitions and exampleFinite abelian groups, SeriesGroup actions: orbit decomposition theorem.Examples of Group actionsSylow theorems. Application of Sylow theoremsSymmetric and Alternating groups Course Description(4) Lecture, three hours; discussion, one hour. Requisite: course 115A. Not open for credit to students with credit for course 117. Ring of integers, integral domains, fields, polynomial domains, unique factorization. P/NP or letter grading.The following schedule anticipates 24 days of instruction, with 2 holidays and 4 days for exams and reviews. If there is extra time, one could do section 6.3 – the structure of R/I when I is prime or maximal and/or section 4.6 – irreducibility in R[x] or C[x].Hungerford, T.,Abstract Algebra, 3rd Ed., Brooks Col.LectureSectionTopicsDivision Algorithm, divisibility, primes, and unique factorization.Congruence and congruence classes, modular arithmetic, Z/pZ when p is a prime.Definition and examples of rings, basic properties.Isomorphims and homomorphism of rings. Review and first midterm. [Note: The book does isomorphism first then homomorphism. The order should probably be inverted.]Polynomials and the Division Algorithm, divisibility in F[x], irreducibles, and unique factorization.Polynomial functions, roots, and reducibility, irreducibility in Q[x].Review, second midterm. Congruence in F[x] and congruence classes.Congruence class arithmetic, the structure of F[x]/(p(x)) when p(x) is irreducible.Ideals and congruence, quotient rings and homomorphisms. Course Description(4) Lecture, three hours; discussion, one hour. Requisite: course 110A or 117. Groups, structure of finite groups. P/NP or letter grading.The course should cover essentially the material between pages 160 and 280 (excluding the section on the simplicity of the appropriate alternating groups; one can come back to this if there is enough time). If there is not enough time, the material at the beginning is more important than the material at the end.Hungerford, T., Abstract Algebra, 3rd Ed., Brooks Col.LectureSectionTopicsDefinition of groups, basic properties.Subgroups, isomorphism, and homomorphism.Congruence and Lagrange’s Theorem, normal subgroups.Quotient groups, review, first midterm.Quotient groups and homomorphism, symmetric and alternating groups.Direct products, finite abelian groups.The Sylow Theorems, review, second midterm.Conjugacy and proof of the Sylow Theorems.The structure of finite groups, groups of small order. Math 110BH: Algebra (Honors) Course Description(4) Lecture, three hours; discussion, one hour. Requisite: course 110A or 117. Groups, structure of finite groups. P/NP or letter grading.The course should cover essentially the material between pages 160 and 280 (excluding the section on the simplicity of the appropriate alternating groups; one can come back to this if there is enough time). If there is not enough time, the material at the beginning is more important than the material at the end.Dummit and Foote, Abstract Algebra, 3rd Ed., Wiley & Sons.Book is Subject to Change Without NoticeLectureSectionTopicsDefinition of groups, basic properties.Subgroups, isomorphism, and homomorphism.Congruence and Lagrange’s Theorem, normal subgroups.Quotient groups, review, first midterm.Quotient groups and homomorphism, symmetric and alternating groups.Direct products, finite abelian groups.The Sylow Theorems, review, second midterm.Conjugacy and proof of the Sylow Theorems.The structure of finite groups, groups of small order. Course Description(4) Lecture, three hours; discussion, one hour. Requisites: courses 110A, 110B. Field extensions, Galois theory, applications to geometric constructions, and solvability by radicals. Math 111: Theory of Numbers Course Description(4) Lecture, three hours; discussion, one hour. Requisite: courses 110A. Algebraic number theory (including prime ideal theory), cyclotomic fields and reciprocity laws, Diophantine equations (especially quadratic forms, elliptic curves), equations over finite fields, topics in theory of primes, including prime number theorem and Dirichlet’s theorem. P/NP or letter grading. Math 114C: Computability Theory Course Description(Formerly numbered 114A). Lecture, three hours; discussion, one hour. Requisite: course 110A or 131A or Philosophy 135. Effectively calculable, Turing computable, and recursive functions; Church/Turing thesis. Normal form theorem; universal functions; unsolvability and undecidability results. Recursive and recursively enumerable sets; relative recursiveness, polynomial-time computability. Arithmetical hierarchy. P/NP or letter grading. Math 114L: Mathematical Logic Course Description(4) Lecture, three hours; discussion, one hour. Requisite: course 110A or 131A or Philosophy 135. Introduction to mathematical logic, aiming primarily at completeness and incompleteness theorems of Godel. Propositional and predicate logic; syntax and semantics; formal deduction; completeness, compactness, and Lowenheim/Skolem theorems. Formal number theory: nonstandard models; Godel incompleteness theorem. P/NP or letter grading. Math M114S: Introduction to Set Theory Course Description(Formerly numbered M112.) (Same as Philosophy M134.) Lecture, three hours; discussion, one hour. Prerequisite: course 110A or 131A or Philosophy 135. Axiomatic set theory as framework for mathematical concepts; relations and functions, numbers, cardinality, axiom of choice, transfinite numbers. P/NP or letter grading.Moschovakis, Y., Notes on Set Theory, 2nd Ed., Springer. Math 115A: Linear Algebra Course Description(5) Lecture, three hours; discussion, two hours. Requisite: course 33A. Techniques of proof, abstract vector spaces, linear transformations, and matrices; determinants; inner product spaces; eigenvector theory. P/NP or letter grading.S. Friedberg, et al, Linear Algebra, 5th Ed., Pearson.LectureSectionTopicsVector Spaces over a FieldLinear Combinations and Systems of Linear Equations; Linear Dependence and Linear IndependenceLinear Dependence and Linear Independence; Bases and DimensionsLinear Transformations, Null Spaces, and RangesLinear Transformations, Null Spaces, and RangesLinear Transformations, Null Spaces, and Ranges; The Matrix Representation of a Linear TransformationThe Matrix Representation of a Linear TransformationComposition of Linear Transformations and Matrix MultiplicationInvertibility and IsomorphismsInvertibility and Isomorphisms; The Change of Coordinate MatrixThe Change of Coordinate MatrixSummary – Important Facts about DeterminantsEigenvalues and EigenvectorsEigenvalues and EigenvectorsInner Products and Norms; The Gram-Schmidt Orthogonalization Process and Orthogonal ComplementsThe Gram-Schmidt Orthogonalization Process and Orthogonal ComplementsThe Adjoint of a Linear OperatorNormal and Self-Adjoint OperatorsNormal and Self-Adjoint Operators Math 115AH: Linear

Algebra (Honors) Course Description(5) Lecture, three hours; discussion, two hours. Requisite: course 33A with grade of B or better. Techniques of proof, abstract vector spaces, linear transformations, and matrices; determinants; inner product spaces; eigenvector theory. Honors course parallel to course 115A. P/NP or letter grading.S. Friedberg, et al, Linear Algebra, 5th Ed., Pearson.Book is Subject to Change Without NoticeLectureSectionTopicsVector Spaces over a FieldLinear Combinations and Systems of Linear Equations; Linear Dependence and Linear IndependenceLinear Dependence and Linear IndependenceBases and DimensionLinear Transformations, Null Spaces, and RangesLinear Transformations, Null Spaces, and RangesLinear Transformations, Null Spaces, and Ranges; The Matrix Representation of a Linear TransformationThe Matrix Representation of a Linear TransformationComposition of Linear Transformations and Matrix MultiplicationInvertibility and IsomorphismsThe Change of Coordinate MatrixThe Change of Coordinate MatrixSummary – Important Facts about DeterminantsEigenvalues and EigenvectorsEigenvalues and EigenvectorsInner Products and NormsThe Gram-Schmidt Orthogonalization Process and Orthogonal ComplementsThe Adjoint of a Linear OperatorNormal and Self-Adjoint OperatorsNormal and Self-Adjoint Operators Math 115B: Linear Algebra Course Description(4) Lecture, three hours; discussion, one hour. Requisite: course 115A. Linear transformations, conjugate spaces, duality; theory of a single linear transformation, Jordan normal form; bilinear forms, quadratic forms; Euclidean and unitary spaces, symmetric skew and orthogonal linear transformations, polar decomposition. P/NP or letter grading.S. Friedberg, et al, Linear Algebra, 5th Ed., Pearson.LectureSectionTopicsReview of Math 115A, Chapters 1 and IIDual Spaces (This section looks short but the concepts are new and thus will take two lectures to do well)Review Sections 5.1 and 5.2 from 115AInvariant Subspaces and the Cayley Hamilton TheoremInvariant Subspaces and the Cayley Hamilton TheoremReview Sections 6.1 - 6.4 including more detail than was done in 115AUnitary and Orthogonal Operators and their matricesUnitary and Orthogonal Operators and their matricesUnitary and Orthogonal Operators and their matricesOrthogonal Projections and the Spectral TheoremOrthogonal Projections and the Spectral TheoremThe Geometry of Orthogonal OperatorsThe Geometry of Orthogonal OperatorsThe Geometry of Orthogonal OperatorsJordan Canonical Form I (This is a long and intricate presentation that is usually done in three lectures, though this may vary at the discretion of the teacher. Math 116: Mathematical Cryptology Course Description(4) Lecture, three hours; discussion, one hour. Requisite: course 115A. Not open for credit to students with credit for Programming in Computing 10A. Introduction to mathematical cryptology using methods of number theory, algebra, probability. Topics include symmetric and public-key cryptosystems, one-way functions, signatures, key exchange, groups, primes, pseudoprimes, primality tests, quadratic reciprocity, factoring, rho method, RSA, discrete log, and elliptic curves. P/NP or letter grading.J. Hoffstein, J. Pipher, and J. Silverman, An Introduction to Mathematical Cryptography, Prentice Hall.LectureSectionTopicsCongruences, Classic Symmetric Ciphers, Intro to Probability. Read: Introduction, 1.1-1.4, 2.1-2.2.Probability (cont.), Applications to Attacks, Permutations. Read: 2.3-2.4, 4.1, 3.1-3.5,4.1-4.2, 6.1-6.3, handout on AES (Rijndael), 7.1-7.2.Theory of Integers (Euclidean Algorithm, Equivalence Relations, Integers mod n, Discrete logs, Primitive roots, Linear Algebra mod n), affine cipher. Read: 7.3-7.8, 8.1-8.2.Public Key Ciphers (RSA, Diffie-Hellman, ElGamal, Knapsack). Read 10.1-10.5.Midterm Monday. Roots mod p. Read: 12.1-12.5,13.1-13.3, 13.5-13.7, 15.1-15.5Roots mod n, Quadratic Reciprocity. Read: 13.1-13.3, 13.5-13.7, 15.1-15.5.Pseudo-primes and Primality tests, Prime Generation. Read: 16.1-16.6.Factorization Attacks. Read: 24.1-24.3.Discrete logs. Read: 27.1-27.3. Math 117: Algebra for Applications Course Description(4) Lecture, three hours; discussion, one hour. Requisite: course 115A. Not open for credit to students with credit for course 110A. Integers, congruences; fields, applications of finite fields; polynomials; permutations, introduction to groups. P/NP or letter grading.Lindsay N. Childs, A Concrete Introduction to Higher Algebra, 3rd Ed., Springer-Verlag.LectureSectionTopicsInduction and binomial theoremEuclidean algorithm, Bezout's identity, unique factorizationCongruences, congruence classes, and error correcting codesTheorems of Euler and FermatChinese remainder theoremApplication of Chinese remainder theorem to RSA cryptographyPolynomials, unique factorizationComplex numbers, fundamental theorem of algebraCongruences modulo a polynomial and Chinese remainder theoremFast polynomial multiplication Math 118: Mathematical Methods of Data Theory Course Description(4) Lecture, three hours; discussion, one hour. Requisites: courses 42 and 115A. Introduction to computational methods for data problems with a focus on linear algebra and optimization. Matrix and tensor factorization, PageRank, assorted other topics in matrices, linear programming, unconstrained optimization, constrained optimization, integer optimization, dynamic programming, and stochastic optimization. P/NP or letter grading.Students will learn key processes of optimization and linear algebra which underlies data science. These include linear programming, unconstrained optimization, constrained optimization, integer optimization, dynamic programming, and stochastic optimization.Required:1. Elden, Lrs. Matrix Methods in Data Mining and Pattern Recognition. The Society for Industrial and Applied Mathematics, 2007.2. Chong, E and S. Zak. An Introduction to Optimization, 4th edition. Wiley, 2013.Supplemental:3. Hillier, Frederick S. and Lieberman, Gerald J. Introduction to Operations Research, 9th edition. McGraw-Hill Higher Education, 2009.LectureSectionTopicsReview of linear algebra, least squares, orthogonality; QR decomposition; Singular-value decomposition (SVD)Elden:Data Mining and Pattern Recognition, Vectors and Matrices, Matrix-Vector Multiplication, Matrix-Matrix Multiplication, Scalar Product and Vector Norms, Matrix Norms, Linear Independence- Bases, The Rank of a Matrix (1.2, 2.1-2.6)Linear Systems and Least Squares, LU Decomposition, Symmetric, Positive Definite Matrices, Perturbation Theory and Condition Number, Rounding Errors in Gaussian Elimination, Banded Matrices, The Least Squares Problem (3.1-3.6)Orthogonal Vectors and Matrices, Elementary Orthogonal Matrices, Number of Floating Point Operations, Orthogonal Transformations in Floating Point Arithmetic (4.1-4.4)Orthogonal Transformation to Triangular Form, Solving the Least Squares Problem, Computing or Not Computing Q, Flop Count for QR Factorization, Error in the Solution of the Least Squares Problem, Updating the Solution of a Least Squares Problem (5.1-5.2)Singular Value Decomposition, Fundamental Subspaces, Matrix Approximation, Principal Component Analysis, Solving Least Squares Problems, Condition Number and Perturbation Theory for the Least Squares Problem, Rank-Deficient and Underdetermined Systems, Computing the SVD, Complete Orthogonal Decomposition (6.1-6.9)Chong & Zak:Real Vector Spaces, Rank of a Matrix, Linear Equations, Inner Products and Norms (2.1-2.4)Linear Transformation, Eigenvalues and Eigenvectors, Orthogonal Projections, Quadratic Forms, Matrix Norms (3.1-3.5)Reduced-rank least squares; Nonnegative matrix factorization...

Math 170E: Introduction to Probability and Statistics: Part 1 Probability Course Description(4) Lecture, three hours; discussion, one hour. Requisites: courses 31A, 31B. Not open to students with credit for course 170A, Electrical and Computer Engineering 131A, or Statistics 100A. Introduction to probability theory with emphasis on topics relevant to applications. Topics include discrete (binomial, Poisson, etc.) and continuous (exponential, gamma, chi-square, normal) distributions, bivariate distributions, distributions of functions of random variables (including moment generating functions and central limit theorem). P/NP or letter grading...

Math 172A: Mathematics of Finance and Actuarial Science... Math 172B: Actuarial Models I... Math 172C: Actuarial Models II... Math 177: Theory of Interest and Applications Course Description(4) Lecture, three hours; discussion, one hour. Requisites: courses 33A, 170E. Time value of money, annuities and other cash flows, accumulation and present value, loans, bonds, yield rates, term structure of interest rates, duration, convexity, immunization, interest rate swaps, and financial derivatives. P/NP or letter grading...

26.14, p.609-612Hull 22.1-22.3, p. 494-504Hull 22.4-22.6, p. 504-512Hull 22.7-22.9, p. 512-517Value at RiskSecond Reading: White, SOA Study Note IFM 21-18, Sections 1 and 2Hull 28.1-28.3, p. 655-660Hull 35.1-35.3, p. 792-796Hull 35.4-35.5, p. 796-803Berk & DeMarzo 10.1-10.4, p. 318-335Risk, Return, DiversificationBerk & DeMarzo 10.5-10.8, p. 335-350Risk, Return, DiversificationBerk & DeMarzo 11.1-11.3, p. 357-369Portfolio Optimization: Variance and CovarianceBerk & DeMarzo 11.4-11.5, p. 369-381Portfolio Optimization: Risk versus ReturnBerk & DeMarzo 11.6-11.8, p. 381-395Efficient Portfolio, Capital Asset Pricing Model and Risk PremiumBerk & DeMarzo 12.1-12.2, p. 404-413Cost of Capital: Equity Cost and Market PortfolioBerk & DeMarzo 12.3-12.4, p. 407-420Beta Estimation and Debt Cost of CapitalBerk & DeMarzo 12.5-12.7, p. 420-433Project Cost and Project RiskSecond Reading: White, SOA Study Note IFM 21-18, p. 1-7Berk & DeMarzo 13.1-13.4, p. 445-455Role of Investor BehaviorBerk & DeMarzo 13.5-13.6, p. 456-469Market Portfolio and EfficiencyBerk & DeMarzo 13.7-13.8, p. 469-479Multifactor Models of RiskSecond Reading: White, SOA Study Note IFM 21-18, p. 1-7Berk & DeMarzo 14.1-14.2, p. 487-498Modigliani-Miller: Equity vs. Debt FinancingBerk & DeMarzo 14.3-14.5, p. 498-511Leverage, Risk, Cost of CapitalBerk & DeMarzo 8.5, p. 258-265Project Analysis: Sensitivity, Break-Even, ScenarioSecond Reading: White, SOA Study Note IFM 21-18, p. 7-18Berk & DeMarzo 16.1-16.3, p. 551-561Default, Bankruptcy, and DistressBerk & DeMarzo 16.4-16.6, p. 562-575Optimal Capital Structure and LeverageBerk & DeMarzo 16.7-16.9, p. 575-588Agency Costs and Asymmetric Information Course Description(4) Lecture, three hours; discussion, one hour. Requisites: courses 31A, 31B, and 61. Strongly recommended preparation: 115A. Graphs and trees. Planarity, graph colorings. Set systems. Ramsey theory. Random graphs. Linear Algebra methods. Ideal for students in computer science and engineering. P/NP or letter grading.The following schedule, with textbook sections and topics, is based on 25 lectures. The remaining classroom meetings are for leeway, reviews, and midterm exams. These are scheduled by the individual instructor. Often there are reviews and midterm exams about the beginning of the fourth and eighth weeks of instruction, plus reviews for the final exam.J. Matousek and J. Nesetril, Invitation to Discrete Mathematics, 2nd Ed., OxfordLectureSectionTopicsBasic counting methods (induction, pigeonhole principle).Graphs, subgraphs, graph isomorphism. Connectivity. Score.Eulerian graphs, diagraphs. Hamiltonian cycles. 2-connected graphs.Trees, their characterizations, isomorphism. Minimal spanning tree problem.Planar graphs. Euler’s formula. Examples of non-planar graphs. Five color theorem.Sperner’s Lemma. Set systems. Sperner’s theorem via LYM inequality.Probabilistic method (expectation, independence). 2-Colorings. Random sorting. Turan’s theorem.Ramsey’s theorem (upper bound, lower bound).Linear algebra methods. Cycle space of a graph. Graham-Pollak theorem. Matrix tree theorem.Probabilistic checking. Finite projective planes. Applications to graphs with no 4-cycles. Course Description(4) Lecture, three hours; discussion, one hour. Requisite: course 3C or 32A and 61. Lecture, three hours; discussion, one hour. Requisite: course 3C or 32A, and 61. Not open for credit to students with credit for Computer Science 180. Graphs, greedy algorithms, divide and conquer algorithms, dynamic programming, network flow. Emphasis on designing efficient algorithms useful in diverse areas such as bioinformatics and allocation of resources. P/NP or letter grading.Kleinberg, Tardos: Algorithm Design, Addison WesleyLectureSectionTopicsIntroduction, Stable Marriage Problem, Gale-Shapley algorithm.Orders of magnitude (Big O notation). Estimating the running time for simple algorithms looking up an entry in a sorted list, mergesort.Basic graph definitions. Directed graphs, trees, paths. Data structures as graphs: stacks, heaps. Breadth first search, Depth First search, test of bipartitness, DAG’s.Introduction to the four main classes of algorithms: Greedy, Divide and Conquer, Dynamic programming, Network flow. Application of greedy algorithms to interval scheduling and shortest path problems, minimum spanning trees.Divide and conquer algorithms. Mergesort, counting inversions, closest pairs of points. Recurrences.Dynamic programming, weighted interval scheduling, Knapsack problems.Dynamic programming continued, RNA secondary structures, sequence alignment.Network flow: Maximum flow problem. Min cuts. Circulations.Network flow: Airline scheduling, Image segmentation, Project selection.Introduction to P and NP. Math 184: Enumerative Combinatorics Course Description(Formerly numbered 180.) Lecture, three hours; discussion, one hour. Requisites: courses 31A, 31B, 61 and 115A. Permutations and combinations, counting principles, recurrence relations and generating functions. Application to asymptotic and probabilistic enumeration. Ideal for students in mathematics and physics. P/NP or letter grading.M. Bona, Introduction to Enumerative Combinatorics , 2nd Ed., Chapman and Hall/CRCLectureSectionTopicsBasic counting methods (induction, pigeonhole principle).Binomial coefficients, multinomial coefficients, set partitions, Stirling numbers.Integer partitions, partitions into odd and distinct numbers. Euler’s Pentagonal theorem.Ordinary and exponential generating functions.Permutations, Number of cycles and descents. Derangements via Inclusion-Exclusion Principle.Inversions. Counting permutation by a cycle type.Counting labeled trees. Different proofs of Cayley’s formula.Catalan numbers. Plane and binary trees.Chromatic polynomial. Enumerations of connected graphs and Eulerian graphs.Sequences. Unimodality. Log-concavity. Math 189HC: Honors Contracts Course Description(1) Tutorial, three hours. Limited to students in College Honors Program. Designed as adjunct to upper-division lecture course. Individual study with lecture course instructor to explore topics in greater depth through supplemental readings, papers, or other activities. May be repeated for maximum of 4 units. Individual honors contract required. Honors content noted on transcript. Letter grading. Math 191: Variable Topics Research Seminars: Mathematics Course Description(Formerly Math 197). Seminar, three hours. Math 191 is a variable topics research course in mathematics. Courses will cover material not covered in the regular mathematics upper division curriculum. Reading, discussion, and development of culminating project. May be repeated for credit with topic and/or instructor change. P/NP or letter grading. Math 191H: Honors Research Seminars: Mathematics Course Description(Formerly Math 190). Math Seminar, three hours. Participating seminar on advanced topics in mathematics. Content varies from year to year. May be repeated for credit by petition. P/NP or letter grading. 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 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 required for majors offered by Mathematics Department. Individual contract required. P/NP or letter grading.

Factoring polynomials is the reverse procedure of the multiplication of factors of polynomials. An expression of the form ax n + bx n-1 +kcx n-2 + ….+kx+ l, where each variable has a constant accompanying it as its coefficient is called a polynomial of degree ‘n’ in variable x. Thus, a polynomial is an expression in which a combination of a constant and a variable is separated … Factoring polynomials is the reverse procedure of the multiplication of factors of polynomials. An expression of the form ax n + bx n-1 +kcx n-2 + ….+kx+ l, where each variable has a constant accompanying it as its coefficient is called a polynomial of degree ‘n’ in variable x. Thus, a polynomial is an expression in which a combination of a constant and a variable is separated … Ap lang unit 2 mcq answers. cf in job af pc dfdc eh ea dcb wbep cifc ikpb cilm hql bbb vjke cbaa fgi cdb tl daf aej fhl dg bhcb aa ocls fhdg lgvk di ca. Scroll to top Русский Корабль … 19/08/2022 · 2016. 10. 24. · Skyrim Special Edition is due out on PS4, PC, and Xbox One on October 28, 2016. The game offers the base version of the critically acclaimed 2011 fantasy RPG plus all existing downloadable content. Best Skyrim Mods 2020 Xbox One The 2011 hit thrived on PC thanks to powerful hardware and a flood of user-created mods.Oct 20, 2018 · StereoVSN. Undergraduate Courses Lower Division Tentative Schedule Upper Division Tentative Schedule PIC Tentative Schedule CCLE Course Sites course descriptions for Mathematics Lower & Upper Division, and PIC Classes All pre-major & major course requirements must be taken for letter grade only! mathematics courses Math 1: Precalculus General Course Outline Course … Membership. More than 6,000 member institutions and organizations drive the College Board’s mission. A worksheet will be created to your specifications, ready to be printed for use. 10, 6. C) It has no odd vertices. al. 2nd through 12th diagnosis code. Jan 30, 2022 · Math ACT scores for placement into MATH 1030, 1040, 1050, 1080, or 2010 (after 24 months you can enroll in MATH 1010 or take a placement test) POLS 2300 SS Applied and Computational Mathematics Master's Program … The product rule is a common rule for the differentiating problems where one function is multiplied by another function. Learn how to apply this product rule in differentiation along with the example at BYJU’S. The product rule is a common rule for the differentiating problems where one function is multiplied by another function. Learn how to apply this product rule in differentiation along with the example at BYJU’S. Membership. More than 6,000 member institutions and organizations drive the College Board’s mission. Learn for free about math, art, computer programming, economics, physics, chemistry, biology, medicine, finance, history, and more. Khan Academy is a nonprofit with the mission of providing a free, world-class education for anyone, anywhere. Ap lang unit 2 mcq answers. cf in job af pc dfdc eh ea dcb wbep cifc ikpb cilm hql bbb vjke cbaa fgi cdb tl daf aej fhl dg bhcb aa ocls fhdg lgvk di ca. Scroll to top Русский Корабль … A worksheet will be created to your specifications, ready to be printed for use. 10, 6. C) It has no odd vertices. al. 2nd through 12th diagnosis code. Jan 30, 2022 · Math ACT scores for placement into MATH 1030, 1040, 1050, 1080, or 2010 (after 24 months you can enroll in MATH 1010 or take a placement test) POLS 2300 SS Applied and Computational Mathematics Master's Program … Learn for free about math, art, computer programming, economics, physics, chemistry, biology, medicine, finance, history, and more. Khan Academy is a nonprofit with the mission of providing a free, world-class education for anyone, anywhere. 19/08/2022 · 2016. 10. 24. · Skyrim Special Edition is due out on PS4, PC, and Xbox One on October 28, 2016. The game offers the base version of the critically acclaimed 2011 fantasy RPG plus all existing downloadable content. Best Skyrim Mods 2020 Xbox One The 2011 hit thrived on PC thanks to powerful hardware and a flood of user-created mods.Oct 20, 2018 · StereoVSN. Learn for free about math, art, computer programming, economics, physics, chemistry, biology, medicine, finance, history, and more. Khan Academy is a nonprofit with the mission of providing a free, world-class education for anyone, anywhere. Learn for free about math, art, computer programming, economics, physics, chemistry, biology, medicine, finance, history, and more. Khan Academy is a nonprofit with the mission of providing a free, world-class education for anyone, anywhere. Undergraduate Courses Lower Division Tentative Schedule Upper Division Tentative Schedule PIC Tentative Schedule CCLE Course Sites course descriptions for Mathematics Lower & Upper Division, and PIC Classes All pre-major & major course requirements must be taken for letter grade only! mathematics courses Math 1: Precalculus General Course Outline Course …