

## Mathematics - prepared by Mr. Jaime Jorge, UPR Resource Center for Science and Engineering

To be able to successfully complete undergraduate math courses, it is very important to **understand the concepts** and to **practice the application of concepts by working on as many exercises as possible**. This page was developed to provide STEM students with links to pages that explain the concepts and provide exercises beyond those included in the textbooks. It is presented in table format and includes:

- The Internet address
- Topics covered at the address
- Type of information (images, examples, theory, practice exercises), and
- A general comment of our experience with the website.

Under the heading “Internet Address”, we include in alphabetical order the global topic that describes the information you will find: Abstract Algebra, Algebra, Calculus, From Basic Math to Calculus, Computer Science, Finite Math and Calculus, Geometry, Trigonometry, Numerical Analysis, Pre-Calculus, Probability, Statistics, Undergraduate Topics. The latter includes topics of all the areas.

At the end of the page you will find addresses to other WebPages that contains links to websites by topics. Like most of the web addresses, they will change with time. **If you find any link that is no longer available or if you find any new helpful link, please let us know.**

Internet Address	Topics	Images	Example	Theory	Practice Exercises	Comments
Abstract Algebra	Abstract Algebra (Integers, Functions, Groups, Polynomials, Rings, Fields, Structure of Groups, Galois Theorem, Unique Factorization, among others sub-fields)	X	X	X		Looks and feels like a textbook. A lot of theory and few examples, but complete in Abstract Algebra.
<a href="http://www.purplemath.com/modules/modules.htm">http://www.purplemath.com/modules/modules.htm</a>						
Algebra	Preliminary topics	X	X	X		A huge list of tutorials classified by sub-topics on each topic of Algebra.
	Beginning Algebra topics	X	X	X		
	Intermediate Algebra topics	X	X	X		
	Advanced Algebra topics	X	X	X		
	Word Problems	X	X	X		
<a href="http://www.algebra.com/algebra/">http://www.algebra.com/algebra/</a>						
Algebra	Linear Equations	X	X	X	X	Some information, examples and exercises on the topics. Some of the topics include web-engine to solve your math problems.
	Linear Systems		X		X	
	Graphing	X		X		
	Polynomials	X		X		
	Systems of Inequities	X		X		
	Linear Functions	X	X	X	X	
Quadratic Equations	X	X	X	X		

	Imaginary Numbers	X		X		
<a href="http://www.cut-the-knot.com/geometry.shtml">http://www.cut-the-knot.com/geometry.shtml</a>						
Algebra	A list of 100+ Algebra sub-topics	X	X	X		Well explained but not classified Algebra sub-topics.
<a href="http://www.ciberteca.net/cgi-bin/visitarenlace.asp?id=743">http://www.ciberteca.net/cgi-bin/visitarenlace.asp?id=743</a>						
Algebra	Algebra	X	X	X	X	A website in Spanish about matrix algebra.
	Matrix	X	X	X	X	
<a href="http://www.exambot.com/study/math/topic.html">http://www.exambot.com/study/math/topic.html</a>						
Calculus and more	Applied Calculus	X	X	X	X	A huge webpage on calculus full of exercises with their theory, explanation and solutions.
	Integral Calculus	X	X	X	X	
	Differential Calculus	X	X	X	X	
	Series	X	X	X	X	
	Analytic Geometry	X	X	X	X	
	Differential Equations	X	X	X	X	
<a href="http://www.satd.uma.es/matap/svera/index.html">http://www.satd.uma.es/matap/svera/index.html</a>						
Calculus	Introduction to calculus	X	X	X		A website in Spanish. It has examples with their procedures.
	Calculus	X	X	X		
<a href="http://archives.math.utk.edu/visual/calculus/">http://archives.math.utk.edu/visual/calculus/</a>						
Calculus	Pre-Calculus	X	X	X		A very complete Pre-Calculus and Calculus tutorial
	Limit and Continuity	X	X	X		
	Derivatives	X	X	X		
	Applications of Differentiations	X	X	X		
	Integration	X	X	X		
<a href="http://www.calc101.com/">http://www.calc101.com/</a>						
Calculus	Long Multiplication		X		X	Full of examples and with a web-engine to solve simple problems. For elaborate problems it is necessary to pay a fee.
	Integrals	For integral solutions you have to pay.				
	Derivatives (Product Rule, Quotient Rule, Chain Rule)		X			
	Integrals (Substitution, Integration by parts, Partial Fractions, Multiple Angles, Using Reduction Formulas, and Trig Powers, Products, Substitutions, and Rationals)		X			
	Special Cases (Special Trig Integrals, Deriving Reduction Formulas)		X			
<a href="http://www.calculus.net/">http://www.calculus.net/</a>						
Calculus	Derivatives (Polynomials, Polynomial Powers, Cosine, Sine, Natural Logarithm, e-linear, Product Rule)	X	X			Full of examples and solutions.
	Integrals (Polynomials, e-linear, Cosine, Sin, Cos^k, Sin^k)	X	X			

Other Math Areas	Pre-Calculus					Each topic is full of sub-topics with an extensive list of external links to exercises and examples (most of the external links are functional).
	Analysis					
	Algebra					
	Number Theory					
<a href="http://www.calculus-help.com/">http://www.calculus-help.com/</a>						
Calculus	All Calculus General Areas	X	X	X		Very good examples, but hard to find specific topics.
<a href="http://www.karlscalculus.org/calculus.html">http://www.karlscalculus.org/calculus.html</a>						
Calculus	Number Systems	X		X		A great tutoring tool on calculus, but without enough examples and no exercises.
	Limits	X		X		
	Continuity	X		X		
	Derivatives	X		X		
	Applications of Derivatives	X		X		
	Exponentials and Logarithms	X		X		
	Trig Functions (sin, cos, etc.)	X		X		
	More Tricks and Derivatives	X		X		
	Summing Up Derivatives	X		X		
	Integrals	X		X		
<a href="http://math.vanderbilt.edu/~pscrooke/toolkit.shtml">http://math.vanderbilt.edu/~pscrooke/toolkit.shtml</a>						
Calculus	Factoring Polynomials, Partial Fractions, Polynomial Equations		X			This page offers you the power of a problem-solving engine so you can solve any problem you type on the topics mentioned.
	Graphs of Functions, Graphs of Equations, Limits		X			
	Derivatives, Antiderivatives, Definite Integrals		X			
	Inverse Functions, Newton's Method, Polynomial Interpolation		X			
	Sums, Parametric Equations, Polar Functions		X			
<a href="http://kelim.jct.ac.il/mirrors/calculus/MODULES/MODULES/topics.htm">http://kelim.jct.ac.il/mirrors/calculus/MODULES/MODULES/topics.htm</a>						
Calculus	Functions	X	X	X	X	A few topics but well explained and with good examples.
	The derivative	X	X	X	X	
	Differential Equations	X	X	X	X	
<a href="http://www.rose-hulman.edu/Class/CalculusProbs/Problems/catlist.html">http://www.rose-hulman.edu/Class/CalculusProbs/Problems/catlist.html</a>						
Calculus, Geometry and Probability	Anti-Differentiation	X	X	X	X	Includes data in all areas, with few examples but well explained.
	Data Fitting	X	X	X	X	
	Difference Equations	X	X	X	X	
	Differential Equations	X	X	X	X	
	Exponential Models	X	X	X	X	
	Geometry	X	X	X	X	
	Integration	X	X	X	X	

	Inverse Problems	X	X	X	X	
	Motion	X	X	X	X	
	Partial Derivates	X	X	X	X	
	Probability	X	X	X	X	
<a href="http://www.math.com/">http://www.math.com/</a>						
From basic Math Through Calculus	Basic Math	X	X	X	X	A very complete tool on the subjects mentioned. Starting from the theory, explanation, examples, and exercises.
	Everyday Math	X	X	X	X	
	Pre-Algebra	X	X	X	X	
	Algebra	X	X	X	X	
	Geometry	X	X	X	X	
	Trigonometry	X	X	X	X	
	Statistics	X	X	X	X	
	Calculus	X	X	X	X	
<a href="http://www.cs.pitt.edu/~kirk/">http://www.cs.pitt.edu/~kirk/</a>						
Computer Science	Undergraduate Algorithms			X	X	Not all the subtopics are complete (neither theory or in exercises).
	Computer Networks			X	X	
	Mobile and Wireless Computing			X	X	
	Internet Middleware			X	X	
	Graduate Algorithms			X	X	
	Algorithm Implementation			X	X	
<a href="http://undergraduate.cs.uwa.edu.au/">http://undergraduate.cs.uwa.edu.au/</a>						
Computer Science	Java programming	X	X	X	X	Tutorials, lessons and practice exercises on all major topics on a Computer Science Bachelor degree.
	Operating systems	X		X		
	Data Structures and Algorithms	X	X	X	X	
	Databases	X	X	X	X	
	Robotics	X		X		
	Networks and Internet	X		X		
	High Performance Computing	X		X		
<a href="http://www.strath.ac.uk/IT/Docs/Ccourse/">http://www.strath.ac.uk/IT/Docs/Ccourse/</a>						
Computer Science	Programming in C			X		This is a book-like tutorial. All about C programming.
	Constant and Variable Types			X		
	Expressions and Operators			X		
	Control Statements			X		
	Functions			X		
	Input and Output			X		
<a href="http://gundam.edatamirror.com/openloop/education/classes/sjsu/sisu_oop/spring01/index.htm">http://gundam.edatamirror.com/openloop/education/classes/sjsu/sisu_oop/spring01/index.htm</a>						
Computer Science	Object Oriented programming	X	X	X	X	Some examples and exercises.
	Java, Java Script, C++	X	X			
<a href="http://csc.uis.edu/~schmoll/Tutorial.html">http://csc.uis.edu/~schmoll/Tutorial.html</a>						

Computer Science	Object Oriented Programming	X		X		A tutorial presentation made on java.
	Classes and Objects	X		X		
	Inheritance and Polymorphism	X		X		
<a href="http://people.hofstra.edu/faculty/Stefan_Waner/RealWorld/index.html">http://people.hofstra.edu/faculty/Stefan_Waner/RealWorld/index.html</a>						
Finite Math and Calculus	Algebra	X	X	X		You can find in this site more information, examples and exercises than it appears. A lot of helpful information.
	Equations	X	X	X		
	Functions	X	X	X		
	Finite Mathematics		X		X	
	Calculus		X		X	
<a href="http://www.xtec.es/~ilagares/integral.esp/integral.htm#E1">http://www.xtec.es/~ilagares/integral.esp/integral.htm#E1</a>						
Defined Integrals	Known areas	X	X	X	X	A website in Spanish with everything you need to know about defined integrals.
	Other areas	X	X	X	X	
	Integral calculus	X	X	X	X	
<a href="http://centros5.pntic.mec.es/~marque12/matem/funciones/indice.htm">http://centros5.pntic.mec.es/~marque12/matem/funciones/indice.htm</a>						
Functions	Introduction to functions	X		X		A website in Spanish with everything you have to know about functions.
	Lineal and quadratic functions	X	X	X	X	
	Trigonometric functions	X	X	X	X	
<a href="http://aleph0.clarku.edu/~djoyce/java/elements/toc.html">http://aleph0.clarku.edu/~djoyce/java/elements/toc.html</a>						
Geometry	Geometry			X		Definitions, postulates and propositions.
	Number Theory			X		
<a href="http://id.mind.net/~zona/contents/contents.html">http://id.mind.net/~zona/contents/contents.html</a>						
Geometry and Trigonometry	Geometry	X	X	X	X	Hard to find the information, but it is well explained.
	Trigonometry	X	X	X	X	
<a href="http://www.geom.umn.edu/docs/reference/CRC-formulas/">http://www.geom.umn.edu/docs/reference/CRC-formulas/</a>						
Geometry	Two-Dimensional Geometry	X		X		Formulas and facts.
	Three-Dimensional Geometry	X		X		
<a href="http://pauillac.inria.fr/algo/bsolve/constant/constant.html">http://pauillac.inria.fr/algo/bsolve/constant/constant.html</a>						
Numeric Analysis	Mathematical Constants	X		X		A list of mathematical constant with their calculations.
<a href="http://www.ping.be/math/">http://www.ping.be/math/</a>						
Pre-Calculus	Trigonometry	X	X	X	X	A complete tutorial and exercises on Pre-Calculus organized in all major sub-topics.
	Complex Numbers	X	X	X	X	
	Matrixes	X	X	X	X	
	Vectors	X	X	X	X	
	Sequences	X	X	X	X	
	Differentiation, Limits	X	X	X	X	
	Exponential and Logarithmic Functions	X	X	X	X	

	Integration	X	X	X	X	
	Analytic Geometry	X	X	X	X	
<a href="http://www.geocities.com/oijk/">http://www.geocities.com/oijk/</a>						
Pre-Calculus	Linear and Quadratics	X	X	X	X	A very complete site on Pre-Calculus with lessons, examples and tests with answers on each topic.
	Inequalities, Functions	X	X	X	X	
	Exponents and Logs	X	X	X	X	
	Analytic Geometry	X	X	X	X	
	Trigonometry	X	X	X	X	
	Limits	X	X	X	X	
<a href="http://ponce.inter.edu/csit/math/precalculo/celp.html">http://ponce.inter.edu/csit/math/precalculo/celp.html</a>						
Pre-Calculus	Basic Algebra	X	X	X		A website in Spanish with explanations and definitions of precalculus subtopics.
	Equations	X	X	X		
	Functions	X	X	X		
<a href="http://personal5.iddeo.es/ztt/index.htm">http://personal5.iddeo.es/ztt/index.htm</a>						
Probability, Statistics and Pre-Calculus	Probability	X	X	X	X	A website in Spanish with lot of exercises and their answer.
	Statistics	X	X	X	X	
	Pre-Calculus	X	X	X	X	
<a href="http://ftp.medprev.uma.es/libro/">http://ftp.medprev.uma.es/libro/</a>						
Probability	Descriptive measurements	X	X	X		A website in Spanish with a tutorial on probability.
	Bidimensional variables	X	X	X		
	Prob. and random variables	X	X	X		
<a href="http://people.hofstra.edu/faculty/Stefan_Waner/cprob/cprobintro.html">http://people.hofstra.edu/faculty/Stefan_Waner/cprob/cprobintro.html</a>						
Probability and Statistics	Continuous Random Variables and Histograms	X	X	X	X	A very helpful, complete and easy to use website on Probability and Statistics.
	Probability Density Functions	X	X	X	X	
	Mean, Median, Variance, and Standard Deviation	X	X	X	X	
<a href="http://faculty.vassar.edu/lowry/VassarStats.html">http://faculty.vassar.edu/lowry/VassarStats.html</a>						
Probability and Statistics	Probabilities		X		X	A web-engine to calculate simple data on the mentioned topics.
	Distributions		X		X	
	Correlation and Regression		X		X	
	t-Tests & Procedures		X		X	
	ANOVA, ANCOVA		X		X	
<a href="http://www.uvm.edu/~dhowell/StatPages/StatHomePage.html">http://www.uvm.edu/~dhowell/StatPages/StatHomePage.html</a>						
Statistics	General Statistics Concepts		X		X	A step by step statistical analysis of various situations.
	General Statistics Distributions		X		X	
	General Statistics Tests		X		X	
<a href="http://www.stats.gla.ac.uk/steps/home.html">http://www.stats.gla.ac.uk/steps/home.html</a>						

Statistics	Statistics program		X		X	A computer program for statistics studies in various topics (biology, business, etc.)
	Statistics modules		X		X	
<a href="http://www.dur.ac.uk/stat.web/">http://www.dur.ac.uk/stat.web/</a>						
Statistics (Biology examples)	Types of Variable	X	X	X	X	A very good statistics' site for biologists. Learn statistics using Biology data.
	Presentation of Data	X	X	X	X	
	Descriptive Statistics	X	X	X	X	
	Binomial Distribution	X	X	X	X	
	Poisson Distribution	X	X	X	X	
	Normal Distribution	X	X	X	X	
	Central Limit Theorem	X	X	X	X	
	Confidence Limits	X	X	X	X	
	Two Sample Tests	X	X	X	X	
<a href="http://www.ibad-laspalmas.com/inferencia/index.html">http://www.ibad-laspalmas.com/inferencia/index.html</a>						
Statistics	Statistics	X	X	X		A website in Spanish with a tutorial on statistics.
	Central limit theorem	X	X	X		
	Estimations	X	X	X		
<a href="http://www.fut.es/~picl/mates/mates00.htm">http://www.fut.es/~picl/mates/mates00.htm</a>						
Undergraduate Topics	Number theory	X	X	X	X	A website in Spanish with some theory; lot of exercises with their solutions.
	Geometry	X	X	X	X	
	Statistics	X	X	X	X	
	Pre-Calculus	X	X	X	X	
	Calculus	X	X	X	X	
<a href="http://www.unlu.edu.ar/~mapco/apuntes/000/mapcopre.htm">http://www.unlu.edu.ar/~mapco/apuntes/000/mapcopre.htm</a>						
Undergraduate Topics	Algebra	X	X	X		A website in Spanish with a hierarchical organization of the topics.
	Pre-Calculus	X	X	X		
	Calculus	X	X	X		
	Probability	X	X	X		
<a href="http://www.ciudadfutura.com/matematicas/">http://www.ciudadfutura.com/matematicas/</a>						
Undergraduate Topics	Algebra	X	X	X	X	A website in Spanish with well organized topics and some exercises.
	Analysis	X	X	X	X	
	Statistics	X	X	X	X	
<a href="http://www.okmath.com/mapa.asp?clave=mapa">http://www.okmath.com/mapa.asp?clave=mapa</a>						
Undergraduate Topics	Algebra	X	X	X	X	A website in Spanish (and in English) with a huge list of exercises organized by topics explained with their theory and their solutions.
	Numeric analysis	X	X	X	X	
	Pre-Calculus	X	X	X	X	
	Calculus	X	X	X	X	
	Probability	X	X	X	X	
<a href="http://www.lafacu.com/apuntes/matematica/">http://www.lafacu.com/apuntes/matematica/</a>						

Undergraduate Topics	Numeric analysis	X	X	X		A website in Spanish that covers almost every area of undergraduate mathematics.
	Geometry	X	X	X		
	Pre-Calculus	X	X	X		
	Calculus	X	X	X		
	Statistics	X	X	X		
<a href="http://thales.cica.es/rd/Indices/RecursosDidacticos-ThalesCICA-MarcosFijos350.html">http://thales.cica.es/rd/Indices/RecursosDidacticos-ThalesCICA-MarcosFijos350.html</a>						
Undergraduate Topics	Algebra	X		X		A website in Spanish full of tutorials but without exercises.
	Numeric analysis	X		X		
	Geometry	X		X		
	Probability and Statistics	X		X		
<a href="http://eureka.va.com/arielrodriguez/links_mate.html">http://eureka.va.com/arielrodriguez/links_mate.html</a>						
Undergraduate Topics	Algebra	X		X		A huge list of electronic textbooks (most of them in PDF format).
	Geometry	X		X		
	Trigonometry	X		X		
	Pre-Calculus	X		X		
	Calculus	X		X		
	Probability and Statistics	X		X		
<a href="http://mathworld.wolfram.com/">http://mathworld.wolfram.com/</a>						
Undergraduate Topics	Algebra	X	X	X		Hundreds of examples by topic well classified. Easy and useful explanations.
	Applied Mathematics	X	X	X		
	Calculus and Analysis	X	X	X		
	Discrete Mathematics	X	X	X		
	Foundations of Mathematics	X	X	X		
	Geometry	X	X	X		
	History and Terminology	X	X	X		
	Number Theory	X	X	X		
	Probability and Statistics	X	X	X		
	Recreational Mathematics	X	X	X		
Topology	X	X	X			
<a href="http://www.math2.org/index.xml">http://www.math2.org/index.xml</a>						
Undergraduate Topics	General	X	X	X		A website in Spanish (and English). This site offers explanations and examples on many sub-topics of the topics mentioned.
	Algebra	X	X	X		
	Geometry	X	X	X		
	Trigonometry	X	X	X		
	Discrete/Linear	X	X	X		
	Statistics	X	X	X		
	Calculus	X	X	X		
<a href="http://www.quickmath.com/">http://www.quickmath.com/</a>						
	Algebra		X			It only has a web-engine to solve problems on the
	Equations		X			

Undergraduate Topics	Inequalities		X			mentioned topics, but it solves problems on all the mentioned topics!
	Calculus		X			
	Matrices		X			
	Graphs		X			
	Numbers		X			
<a href="http://cne.gmu.edu/modules/dau/">http://cne.gmu.edu/modules/dau/</a>						
Undergraduate Topics	Math Refresher (from basic math through Pre-calculus)	X	X	X		A textbook-like webpage with good examples.
	Probability and Statistics	X	X	X		
<a href="http://www.sosmath.com/index.html">http://www.sosmath.com/index.html</a>						
Undergraduate Topics	Algebra	X	X	X	X	A complete website with quizzes and exams on the topics with their answers.
	Trigonometry	X	X	X	X	
	Calculus	X	X	X	X	
	Differential Equations	X	X	X	X	
	Complex Variables	X	X	X	X	
	Matrix Algebra	X	X	X	X	
<a href="http://www.ping.be/~ping1339/mathindex.htm">http://www.ping.be/~ping1339/mathindex.htm</a>						
Undergraduate Topics	Algebra	X	X	X		A tutorial website with good examples well organized and a complete index.
	Trigonometry	X	X	X		
	Pre-Calculus	X	X	X		
	Lineal Algebra	X	X	X		
	Complex Numbers	X	X	X		
	Matrix Algebra	X	X	X		
<a href="http://home.earthlink.net/~djbach/lessons.html">http://home.earthlink.net/~djbach/lessons.html</a>						
Undergraduate Topics	Basic Skills		X	X		A good tutorial on some of the undergraduate sub-topics.
	Precalculus		X	X		
	Calculus		X	X		
	Beyond Calculus		X	X		
<b>Other Links</b>						
- Algebra:	<a href="http://www.purplemath.com/internet.htm">http://www.purplemath.com/internet.htm</a>				All these websites includes a list of links to newsletters, associations and other help sites on the selected topics.	
- Computer Science:	<a href="http://www.acm.org/crossroads/resources/undergrad.html">http://www.acm.org/crossroads/resources/undergrad.html</a>					
- Geometry:	<a href="http://www.ics.uci.edu/~eppstein/junkyard/topic.html">http://www.ics.uci.edu/~eppstein/junkyard/topic.html</a>					
- Statistics:	<a href="http://www.statsci.org/">http://www.statsci.org/</a>					
- Others:	<a href="http://archives.math.utk.edu/">http://archives.math.utk.edu/</a>					
	<a href="http://mathforum.org/">http://mathforum.org/</a>					