

## Chapter 1 : Linear Algebra | Khan Academy

*PREFACE This collection of exercises is designed to provide a framework for discussion in a junior level linear algebra class such as the one I have conducted fairly regularly at Portland State University.*

I fell into the trap that many web developers fall into. I knew what was in the menus and so clearly all the users would as well. It was appearing that many new users were not aware of the Practice Problems on the site so I added a set of links at the top to allow for easy switching between the Notes, Practice Problems and Assignment Problems. They will only appear on the class pages which have Practice and Assignment problems. The links should stay at the top as you scroll through the page. Paul November 7, Mobile Notice

You appear to be on a device with a "narrow" screen width. Due to the nature of the mathematics on this site it is best viewed in landscape mode. If your device is not in landscape mode many of the equations will run off the side of your device. You should be able to scroll to see them and some of the menu items will be cut off due to the narrow screen width.

Algebra Here are a set of practice problems for the Algebra notes. Click on the "Solution" link for each problem to go to the page containing the solution. Note that some sections will have more problems than others and some will have more or less of a variety of problems. Most sections should have a range of difficulty levels in the problems although this will vary from section to section. Here is a listing of sections for which practice problems have been written as well as a brief description of the material covered in the notes for that particular section.

**Preliminaries** - In this chapter we will do a quick review of some topics that are absolutely essential to being successful in an Algebra class. We review exponents, integers and rational numbers, radicals, polynomials, factoring polynomials, rational expressions and complex numbers.

**Integer Exponents** - In this section we will start looking at exponents. We will give the basic properties of exponents and illustrate some of the common mistakes students make in working with exponents. Examples in this section will be restricted to integer exponents. Rational exponents will be discussed in the next section.

**Rational Exponents** - In this section we will define what we mean by a rational exponent and extend the properties from the previous section to rational exponents. We will also discuss how to evaluate numbers raised to a rational exponent.

**Radicals** - In this section we will define radical notation and relate radicals to rational exponents. We will also give the properties of radicals and some of the common mistakes students often make with radicals. We will also define simplified radical form and show how to rationalize the denominator.

**Polynomials** - In this section we will introduce the basics of polynomials, a topic that will appear throughout this course. We will define the degree of a polynomial and discuss how to add, subtract and multiply polynomials.

**Factoring Polynomials** - In this section we look at factoring polynomials, a topic that will appear in pretty much every chapter in this course and so is vital that you understand it. We will discuss factoring out the greatest common factor, factoring by grouping, factoring quadratics and factoring polynomials with degree greater than 2.

**Rational Expressions** - In this section we will define rational expressions. We will discuss how to reduce a rational expression to lowest terms and how to add, subtract, multiply and divide rational expressions.

**Complex Numbers** - In this section we give a very quick primer on complex numbers including standard form, adding, subtracting, multiplying and dividing them.

**Solving Equations and Inequalities** - In this chapter we will look at one of the most important topics of the class. The ability to solve equations and inequalities is vital to surviving this class and many of the later math classes you might take. We will discuss solving linear and quadratic equations as well as applications. In addition, we will discuss solving polynomial and rational inequalities as well as absolute value equations and inequalities.

**Solutions and Solution Sets** - In this section we introduce some of the basic notation and ideas involved in solving equations and inequalities. We define solutions for equations and inequalities and solution sets.

**Linear Equations** - In this section we give a process for solving linear equations, including equations with rational expressions, and we illustrate the process with several examples. In addition, we discuss a subtlety involved in solving equations that students often overlook.

**Applications of Linear Equations** - In this section we discuss a process for solving applications in general although we will focus only on linear equations here.

**Equations With More Than One Variable** - In this section we will look at solving equations with more than one

variable in them. These equations will have multiple variables in them and we will be asked to solve the equation for one of the variables. This is something that we will be asked to do on a fairly regular basis.

**Quadratic Equations, Part I** – In this section we will start looking at solving quadratic equations. Specifically, we will look at factoring and the square root property in this section. We will use completing the square to solve quadratic equations in this section and use that to derive the quadratic formula. The quadratic formula is a quick way that will allow us to quickly solve any quadratic equation.

**A Summary** – In this section we will summarize the topics from the last two sections. We will give a procedure for determining which method to use in solving quadratic equations and we will define the discriminant which will allow us to quickly determine what kind of solutions we will get from solving a quadratic equation.

**Applications of Quadratic Equations** – In this section we will revisit some of the applications we saw in the linear application section, only this time they will involve solving a quadratic equation.

**Equations Reducible to Quadratic Form** – Not all equations are in what we generally consider quadratic equations. However, some equations, with a proper substitution can be turned into a quadratic equation. These types of equations are called quadratic in form. In this section we will solve this type of equation.

**Equations with Radicals** – In this section we will discuss how to solve equations with square roots in them. As we will see we will need to be very careful with the potential solutions we get as the process used in solving these equations can lead to values that are not, in fact, solutions to the equation.

**Linear Inequalities** – In this section we will start solving inequalities. We will concentrate on solving linear inequalities in this section both single and double inequalities. We will also introduce interval notation.

**Polynomial Inequalities** – In this section we will continue solving inequalities. However, in this section we move away from linear inequalities and move on to solving inequalities that involve polynomials of degree at least 2.

**Rational Inequalities** – We continue solving inequalities in this section.

**Absolute Value Equations** – In this section we will give a geometric as well as a mathematical definition of absolute value. We will then proceed to solve equations that involve an absolute value. We will also work an example that involved two absolute values.

**Absolute Value Inequalities** – In this final section of the Solving chapter we will solve inequalities that involve absolute value. First, we will start discussing graphing equations by introducing the Cartesian or Rectangular coordinates system and illustrating use of the coordinate system to graph lines and circles. We will also formally define a function and discuss graph functions and combining functions. We will also discuss inverse functions.

**Graphing** – In this section we will introduce the Cartesian or Rectangular coordinate system. We will illustrate these concepts with a couple of quick examples.

**Lines** – In this section we will discuss graphing lines. We will introduce the concept of slope and discuss how to find it from two points on the line. In addition, we will introduce the standard form of the line as well as the point-slope form and slope-intercept form of the line. We will finish off the section with a discussion on parallel and perpendicular lines.

**Circles** – In this section we discuss graphing circles. We introduce the standard form of the circle and show how to use completing the square to put an equation of a circle into standard form.

**The Definition of a Function** – In this section we will formally define relations and functions. We introduce function notation and work several examples illustrating how it works. We also define the domain and range of a function. In addition, we introduce piecewise functions in this section.

**Graphing Functions** – In this section we discuss graphing functions including several examples of graphing piecewise functions.

**Combining functions** – In this section we will discuss how to add, subtract, multiply and divide functions. In addition, we introduce the concept of function composition.

**Inverse Functions** – In this section we define one-to-one and inverse functions. We also discuss a process we can use to find an inverse function and verify that the function we get from this process is, in fact, an inverse function.

**Common Graphs** - In this chapter we will look at graphing some of the more common functions you might be asked to graph. We graph parabolas, ellipses, hyperbolas and rational functions in this chapter. We will also look at transformations of functions and introduce the concept of symmetry.

**Parabolas** – In this section we will be graphing parabolas. We introduce the vertex and axis of symmetry for a parabola and give a process for graphing parabolas.

**Ellipses** – In this section we will graph ellipses. We introduce the standard form of an ellipse and how to use it to quickly graph an ellipse.

**Hyperbolas** – In this section we will graph hyperbolas. We introduce the standard form of a hyperbola and

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how to use it to quickly graph a hyperbola. Collectively these are often called transformations and if we understand them they can often be used to allow us to quickly graph some fairly complicated functions. Symmetry – In this section we introduce the idea of symmetry. We discuss symmetry about the x-axis, y-axis and the origin and we give methods for determining what, if any symmetry, a graph will have without having to actually graph the function. Rational Functions – In this section we will discuss a process for graphing rational functions. We will also introduce the ideas of vertical and horizontal asymptotes as well as how to determine if the graph of a rational function will have them.

## Chapter 2 : Exams | Linear Algebra | Mathematics | MIT OpenCourseWare

*Linear Algebra on Brilliant, the largest community of math and science problem solvers.*

## Chapter 3 : Practice Math Problems | calendrierdelascience.com

*Solutions to Linear Algebra Practice Problems 1 1. Determine which of the following augmented matrices are in row echelon form, row reduced echelon form or neither.*

## Chapter 4 : Algebra Worksheets

*MATHEMATICS DEPARTMENT Home Page | InfoEagle Home Page | Boston College Home Page.*

## Chapter 5 : Algebra (Practice Problems)

*Ace your next math test with unlimited practice problems covering arithmetic, algebra, calculus, and more. A great study aid for students and teaching tool for educators.*

## Chapter 6 : Linear equations word problems (practice) | Khan Academy

*7d: If the standard vectors  $\{e_1, e_2, \dots, e_n\}$  are eigenvectors of an  $n \times n$  matrix, then the matrix is diagonal. 7e: If 1 is the only eigenvalue of an  $n \times n$  matrix  $A$ , then  $A$  must be  $I$ .*

## Chapter 7 : Algebra problems | Algebra Practice Problems

*Solve word problems about real world relationships that are given in formulas.*

## Chapter 8 : Algebra - Linear Equations (Practice Problems)

*PracticeProblems2 Linear Algebra, Dave Bayer, March 18, [1] Let  $V$  and  $W$  be the subspaces of  $R^2$  spanned by  $(1,1)$  and  $(1,2)$ , respectively. Find vectors  $v \in V$ .*

## Chapter 9 : Linear Algebra Tests and Solutions

*Algebra. Here are a set of practice problems for the Algebra notes. Click on the "Solution" link for each problem to go to the page containing the calendrierdelascience.com that some sections will have more problems than others and some will have more or less of a variety of problems.*