

Unit 2 Lesson 1

Multivariable Equations/Systems

Background

- Unit 2 focuses on equations with more than 1 variable
- This part will focus on solving them algebraically
- Part 2 focuses on graphical solutions
- For more information see
- <http://www.purplemath.com/modules/systlin1.htm>

Introduction to Multivariable Algebra

- Sometimes, were in a situation that has multiple unknown parameters
- We can solve an equation for one parameter in terms of another
- Must have n equations for n unknown parameters
- Multiple methods of solving

Method 1: Substitution

- Solve for first variable in terms of second variable in Equation 1
- Substitute expression for first variable into Equation 2
- Solve Equation 2 numerically for second variable
- Plug value for second variable into Equation 1 and solve for first variable
- See <http://www.purplemath.com/modules/systlin4.htm>

Example

- Given $x + y = 4$
 $x - 2y = 7$
- Solve first equation for x $x = 4 - y$
- Substitute into second equation $(4 - y) - 2y = 7$
- Solve for y $y = -1$
- Substitute into first equation $x + (-1) = 4$
- Solve for x $x = 5$

Method 2: Elimination

- Manipulate the series of equations as a whole
- Multiply an entire equation by a factor so that one variable has the same coefficient in each equation
- Subtract the two equations
- Solve for the remaining variable
- Substitute and solve for the second variable
- See <http://www.purplemath.com/modules/systlin5.htm>

Example

- Given $2x + y = 4$
 $x - 2y = 7$
- Multiply second equation by 2 $2(x - 2y) = (2)7$
 $2x - 4y = 14$
- Subtract two equations $2x + y = 4$
 $\underline{-(2x - 4y) = -(14)}$
 $5y = -10$
- Solve for y $y = -2$
- Plug in and solve for x $2x + (-2) = 4$
 $x = 3$

Note

- The same procedure can be used for 3,4,5...variables
- Solve for one variable, substitute it back in, and solve for the others
- Have patience!