U3D1

Solving Linear Systems in 3-Variables

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Solve by elimination:

Eliminate 1 variable by adding the equations together after getting additive opposites.

1. $2x + 3y = 7$

$(2x + y = 3)\cdot(-1)$

$2x + 3y = 7$

$-2x - y = -3$

$2y = 4$

$y = 2$

$2x + y = 3$

$2x + 2 = 3$

$-2 \quad -2$

$\frac{2x}{2} = \frac{1}{2}$

$x = 1/2$

$x = 1/2$, $y = 2$ → $(1/2, 2)$

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2. $5x - 2y = 4$

$(-2x + y = 2)2$

$5x - 2y = 4$

$-4x + 2y = 4$

$x = 8$

$-2x + y = 2$

$-2(8) + y = 2$

$-16 + y = 2$

$+16 \quad +16$

$y = 18$

$x = 8$

$y = 18$

or $(8, 18)$

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What if you want to solve for 3 variables?

3 equations

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How would you solve the following?

1. Combine 2 EQs at a time to get EQs 4 & 5 by eliminating the same variable.

① $2x + 3y - z = 5$
② $4x - y - z = -1$
③ $x + 4y + z = 12$?

Eliminate z

① + ③
$2x+3y-z=5$
$x+4y+z=12$
$3x+7y=17$ ④

② + ③
$4x-y-z=-1$
$x+4y+z=12$
$5x+3y=11$ ⑤

2. Solve the 2 variable system with EQs 4 & 5

④ $(3x+7y=17)5$
⑤ $(5x+3y=11)-3$
$15x+35y=85$
$-15x-9y=-33$
$26y=52$
$\frac{26y}{26}=\frac{52}{26}$
$y=2$

Find x
③ $5x+3y=11$
$5x+3(2)=11$
$5x+6=11$
$5x=5$
$x=1$

3. Find last variable by substituting your 2 solutions into an original EQ.

① $2x+3y-z=5$
$2(1)+3(2)-z=5$
$2+6-z=5$
$8-z=5$
$-8 \quad -8$
$-z=-3$
$z=3$

$x=1$
$y=2$
$z=3$

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Solve:

① $x + 2y - z = 8$
② $y + z = 4$
③ $x - y - z = 2$

eliminate z

Check
$x+2y-z=8$
$0x+y+z=4$
$x-y-z=2$

② + ③
$y+z=4$
$x-y-z=2$
$x=6$

① + 2③
$x+2y-z=8$
$2x-2y-2z=4$
$3x-3z=12$
$x=6$
$3(6)-3z=12$
$18-3z=12$
$-18 \quad -18$
$-3z=-6$
$\frac{-3z}{-3}=\frac{-6}{-3}$
$z=2$

Need y
② $y+z=4$
$y+2=4$
$y=2$

$x=6$
$y=2$
$z=2$

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Check using your graphing calculator.

[2nd] [x^{-1}] Brings up MATRIX

[EDIT] Choose A. Asks for size. Enter number of rows by number of columns. Enter coefficients in x, y, z, constant order. Then [2nd] mode to quit.

[2nd] [x^{-1}] Brings up MATRIX again.

[MATH] [B:rref(] [2nd] [x^{-1}] [1:[A]]

Let's practice by checking the previous 2 questions.

Oct 15-3:55 PM