1 Substitution (8.2)

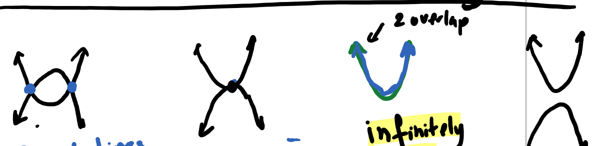
November 26, 2019 9:41 PM

PRE-CALCULUS 11 Chapters 8-9 – Day 2: SOLVING SYSTEMS OF EQUATIONS ALGEBRAICALLY (Part 1)

solve more than 1 equation

SOLVING SYSTEMS ALGEBRAICALLY

Quadratic – Quadratic System



2 solutions | 1 solution | infinitely many solutions Ex: 3=3 TRUE | no solution Ex: 3=4 FALSE

The solution of a system of equations can be solved:

- ~~graphically, or~~
- ***algebraically*** - either:
  - with the ***substitution method***, or
  - with the *elimination method*.

SOLVING SYSTEMS OF EQUATIONS WITH THE SUBSTITUTION METHOD

To solve a system of equations algebraically using The Substitution Method:

1. Solve Rewrite one of the equations for one of the variables; choose carefully.
2. Take the expression equal to that variable and *substitute* it into the other equation; the result should be a single equation with a single variable.
3. Solve this equation; find the roots - the values of this first variable.
4. *Substitute* each of these roots into an equation with both variables - one at a time; each of these roots will produce an equation with the second variable.
5. Solve these equations; find the value of the second variable.

Example 1: Solve this system of equations BY SUBSTITUTION.

$x^2 - y = 0$ and $x - y = -2$

Steps: Isolate

- ~~Solve for~~ y in the linear function

$x^2 - y = 0$ $x - y = -2$ $y = x + 2$

- Substitute expression for y into the quadratic function.

$x^2 - 1(x+2) = 0$

$x^2 - x - 2 = 0$

- Solve this quadratic equation.

$(x-2)(x+1) = 0$

$x = 2$ or $x = -1$

- Substitute each of these x-values Into the linear function to find the Corresponding y-values.

Easier to use $y = x + 2$

If $x = 2$, $y = 2 + 2 = 4$

If $x = -1$, $y = -1 + 2 = 1$

Sol'n $\{(2,4), (-1,1)\}$

Could this example be solved with the substitution method using different decisions?

Yes!

Example 2: Solve using The Substitution Method. Find the *exact* values.

① $y = x^2 + 2$ and ② $2x - y + 1 = 0$

Rewrite ② => ③ $y = 2x+1$

Substitute ③ into ①.

$y = x^2 + 2$

$2x + 1 = x^2 + 2$

$-2x - 1 \quad -2x - 1$

$x^2 - 2x + 1 = 0$ $\quad (a-b)^2 = a^2 - 2ab + b^2$

$(x-1)^2 = 0$

$(x-1)(x-1) = 0$

$x = 1$

Find corr. y:

$y = 2x + 1$

$= 2(1) + 1 = 3$

Soltn: $\{(1, 3)\}$

Assignment: Sec 8.2, p. 451 #1-3, 8, 13, 14

Solve by SUBSTITUTION:

a) $y = x^2 - 4x + 2$ and
$3x + 2y - 11 = 0$

b) $y = x^2 - 4x + 2$ and
$x - 2y - 8 = 0$

(Just in case: quadratic formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$)

Ans: a) {(-1, 7), $(\frac{7}{2}, \frac{1}{4})$ } b) no solution

b) $y = (x + 1)^2 - 4$ and $y = -2x^2 + 7$ (challenge) REMOVED BECAUSE very long answer (Ms. Chang's notes)