UNIT 4: Solving SYSTEMS of Equations using SUBSTITUTION method!

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Solving Systems by Substitution

I can solve a system of equations by substitution.

Solve this system of equations using substitution. Check.

$$3y - 2x = 11$$
$$y = 9 - 2x$$

The substitution method is used to eliminate one of the variables by replacement when solving a system of equations.

Think of it as "grabbing" what one variable equals from one equation and "plugging" it into the other equation.

Systems of Equations may also be referred to as "simultaneous equations".

Let's look at an example using the substitution method:

Solve this system of equations (and check):

"substitute"

1. Replace the "y" value in the first equation by what "y" now equals. Grab the "y" value and plug it into the other equation.

* distribute
* multiplication

2. Solve this new equation for "x".

* Combine like terms

$$3(y) - 2x = 11$$
$$\Rightarrow y = 9 - 2x$$

$$3(y) - 2x = 11$$
$$3(9 - 2x) - 2x = 11$$

$$3(9 - 2x) - 2x = 11$$
$$3(9) - 3(2x) - 2x = 11$$

$$27 - 6x - 2x = 11$$
$$27 + (-6x) + (-2x) = 11$$
$$27 - 8x = 11$$
$$+(-27)$$
$$-8x = -16$$
$$\frac{-8x}{-8} = \frac{-16}{-8}$$
$$\boxed{x = 2}$$

4. Place this new "x" value into either of the ORIGINAL equations in order to solve for "y". Pick the easier one to work with!

$$y + 2x = 9 \text{ or}$$
$$y = 9 - 2x$$
$$y = 9 - 2(2)$$
$$y = 9 - 4$$
$$\boxed{y = 5}$$

Which is the FROG and which is the BUG?

Solving Systems by Substitution — NOTES

$y = 20$
$y = 5x - 10$

$20 = 5x - 10$
$+10 \qquad +10$

$\dfrac{30}{5} = \dfrac{5x}{5}$

$6 = x$

Solution: $(6, 20)$
$\qquad\quad x \quad y$

Check solutions

$y = 20$ ✓

$y = 5x - 10$
$20 = 5(6) + (-10)$
$20 = 30 + (-10)$
$20 = 20$ ✓

$y = x + 5$ ← Easier Equation
$y = 2x - 12$

$x + 5 = 2x - 12$
$\quad -x \qquad -x$

$\dfrac{5 = x - 12}{+12 \qquad +12}$

$17 = x$

$y = x + 5$
$y = (17) + 5$
$Y = 22$

Solution: $(17, 22)$

Check solutions

$y = x + 5$
$22 = (17) + 5$
$22 = 22$ ✓

$y = 2x - 12$
$22 = 2(17) - 12$
$22 = 34 - 12$
$22 = 22$ ✓

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2) $y = 5x$ ← FROG
$y = 2x + 9$

$5x = 2x + 9$
$-2x \quad -2x$

$\dfrac{3x}{3} = \dfrac{9}{3}$

$x = 3$

Solution: $(3, 15)$

Check solutions

$y = 5x$
$15 = 5(3)$
$15 = 15$ ✓

$y = 2x + 9$
$15 = 2(3) + 9$
$15 = 6 + 9$
$15 = 15$ ✓

$y = 5x$
$Y = 5(3)$
$Y = 15$

STEPS to follow when Solving Systems by Substitution...

① Substitute to make one equation with one variable.

② Solve the equation by UNDOING the order of operations.

③ Substitute your solution back in for your known variable to calculate the second value.

④ Write your solution as a coordinate point.

⑤ Check your solution by substituting your solution back into both equations.