Note Title 6/1/2015

8.2 Solving Systems of Equations Algebraically (Part 1)

To solve means: to find the values of x & y that satisfy each equation.

Steps to solve by substitution

Example: solve
$$5x - y = 10 \quad (1)$$
$$x^2 + x - 2y = 0 \quad (2)$$

(1) label each equation

(2) Isolate one of the variables in either equation (look for a variable with a coeff. of 1)

Isolate y in (1)
$$5x - y = 10$$
$$y = 5x - 10$$

(3) Substitute the result from step (2) into the other equation
$$x^2 + x - 2(5x - 10) = 0$$

(4) Solve the equation
$$x^2 + x - 2(5x - 10) = 0$$
$$x^2 + x - 10x + 20 = 0$$
$$x^2 - 9x + 20 = 0$$
$$(x-5)(x-4) = 0$$
$$\downarrow \qquad \downarrow$$
$$x = 5 \qquad x = 4$$

(5) Substitute and solve for the remaining variable

$x = 5$: $y = 5x - 10$

$y = 5(5) - 10 \qquad y = 15$

$\boxed{(5, 15)}$

$x = 4 : \qquad y = 5(4) - 10 \qquad y = 10$

$\boxed{(4, 10)}$

⑥ Verify the solution(s).

$\boxed{(5, 15)}$: $5x - y = 10$

$5(5) - 15 = 10$ ✓

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

$(5)^2 + 5 - 2(15) = 0$ ✓

$\boxed{(4, 10)}$: $5(4) - 10 = 10$ ✓

$(4)^2 + 4 - 2(10) = 0$ ✓

Try this : b) $x - y = -4$

$x^2 + x - y = 0$

$\boxed{(2, 6) \quad (-2, 2)}$

c) $x^2 + 3x - y - 2 = 0$ ①

$x^2 + y = 4x - 3$ ②

isolate "y" in ①

$y = x^2 + 3x - 2$

Now sub into ②

$x^2 + (x^2 + 3x - 2) = 4x - 3$

$2x^2 - x + 1 = 0 \Rightarrow$ cannot be factored

Use quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-(-1) \pm \sqrt{(-1)^2 - 4(2)(1)}}{2(2)}$$

$$= \frac{1 \pm \sqrt{-7}}{4}$$ → negative discrimanent!

No solution

(graphs do not intersect)

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