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- Return Graded Work

Oct 25, 2018

- Announcements:

① Extra Credit in §4.4, Tues 10/30 from 10:30 - 11:30am in 2-213

② Fun fact. If you attend 6 or more extra credit sessions, your final course grade (after the final exam has been entered) will go up by 3%. That's HUGE!

③ Any extra credit may be turned in at any time up 'til the final exam

→ All of §8.6 Solving Systems of Nonlinear Equations (pp117 - 118)

* 5 days until the Chapter 4 and 5 Test

To study, complete the Chapter 4 and 5 Test Practice Problems over and over until you can complete each one correctly, quickly, and confidentially, with the ability to explain why each problem is solved that way.

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p117 (8.6) #9 Solve the system:

$$\begin{cases} x + y + 3 = 0 \quad [1] \\ x^2 + y^2 + 4y - 3x = -3 \quad [2] \end{cases}$$

Draw chooses x

substitution:

[1] $x + y + 3 = 0$ (solve for x)

$x = -y - 3$

[2] $x^2 + y^2 + 4y - 3x = -3$

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

$y^2 + 6y + 9 + y^2 + 4y + 3y + 9 = -3$

Sidework

$(-y-3)^2$

$(-y-3)(-y-3)$

$y^2 + 3y + 3y + 9$

$y^2 + 6y + 9$

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p117 (8.6) Solve the system:

$$\begin{cases} x + y + 3 = 0 & [1] \\ x^2 + y^2 + 4y - 3x = -3 & [2] \end{cases}$$

Omar chooses x

substitution:

[1] $x + y + 3 = 0$ (solve for x)

$x = -y - 3$

[2] $x^2 + y^2 + 4y - 3x = -3$

* $(-y-3)^2 + y^2 + 4y - 3(-y-3) = -3$

$y^2 + 6y + 9 + y^2 + 4y + 3y + 9 = -3$

Sidework

* $(-y-3)^2$

$(-y-3)(-y-3)$

$y^2 + 3y + 3y + 9$

$y^2 + 6y + 9$

$y^2+6y+9+y^2+4y+3y+9=-3$

$2y^2+13y+18=-3$

$+3 \quad +3$

$2y^2+13y+21=0$

Side B Divide

$(2y^2+13y+21=0)$ ÷ 2

$y^2+13y+42=0$

$(y+6)(y+7)=0$

$(y+3)(y+\frac{7}{2})=0$

$(y+3)(2y+7)=0$

$(y+3)(2y+7)=0$

$y+3=0$ $\qquad$ $2y+7=0$

$y=-3$ $\qquad$ $y=-\frac{7}{2}$

$(?,-3)$ $\qquad$ $(?,-\frac{7}{2})$

I still have to find the "x"s for these two points. So, we can use any of the equations above to plug in these two values of y to find out our x values. But there's an easiest of all: Prof Lacoste chooses $x=-y-3$

If $y=-3$, then

$x=-y-3$

$x=-(-3)-3$

$x=3-3$

$x=0$ $\qquad$ $(0,-3)$

If $y=-\frac{7}{2}$, then

$x=-y-3$

$x=-(-\frac{7}{2})-3$

$x=+\frac{7}{2}-\frac{3}{1}\cdot\frac{(2)}{(2)}$

$x=\frac{7}{2}-\frac{6}{2}$

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

$(\frac{1}{2},-\frac{7}{2})$

We still have to check: (To check, we need to use the original equations)

→ check (0, -3) in equation [1]

[1] $x + y + 3 = 0$

$0 + (-3) + 3 = 0$

$0 = 0$ ✓

→ check (0, -3) in equation [2]

[2] $x^2 + y^2 + 4y - 3x = -3$

$0^2 + (-3)^2 + 4(-3) - 3(0) = -3$

$9 - 12 = -3$

$-3 = -3$ ✓

→ check $\left(\frac{1}{2}, -\frac{7}{2}\right)$ in equations [2] [1]

[2] ~~xxxxxxxx~~

[1] $x + y + 3 = 0$

$\frac{1}{2} + \left(-\frac{7}{2}\right) + 3 = 0$

$\frac{1 + (-7)}{2} + 3 = 0$

$\frac{-6}{2} + 3 = 0$

$-3 + 3 = 0$

$0 = 0$ ✓

→ check $\left(\frac{1}{2}, -\frac{7}{2}\right)$ in equation [2]

$x^2 + y^2 + 4y - 3x = -3$

$\left(\frac{1}{2}\right)^2 + \left(-\frac{7}{2}\right)^2 + 4\left(-\frac{7}{2}\right) - 3\left(\frac{1}{2}\right) = -3$

$\frac{1}{2} \cdot \frac{1}{2}$

$$\frac{1}{4} + \frac{49}{4} + \left(-\frac{28}{2}\right) - \frac{3}{2} = -3$$

$$\frac{50}{4} - \frac{28}{2} - \frac{3}{2} = -3$$

$$\frac{25}{2} - \frac{31}{2} = -3$$

$$\frac{25-31}{2} = -3$$

$$\frac{-6}{2} = -3$$

$$-3 = -3 \checkmark$$

So, final answer: $\left\{(0,-3), \left(\frac{1}{2}, -\frac{7}{2}\right)\right\}$

#8.6.38 Solve:

- The difference of two numbers is 2:

$$x - y = 2$$

- The sum of their squares is 10

$$x^2 + y^2 = 10$$

Find the numbers:

$$\begin{cases} x - y = 2 & [1] \\ x^2 + y^2 = 10 & [2] \end{cases}$$

→ Substitution (because we have x and/or y with coefficient 1 and no printed exponent). In this case, it's easier to solve for x, because it's positive!

Dave chooses to solve equation [1] for x:

$$x - y = 2 \quad [1]$$

$$\boxed{x = 2 + y}$$

Now, we substitute in the other equation (#2)

$x = 2+y$ [1]

$x^2 + y^2 = 10$

$(2+y)^2 + y^2 = 10$

$(2+y)(2+y) + y^2 = 10$

$y^2 + 4y + 4 + y^2 = 10$

$2y^2 + 4y + 4 = 10$

$-10 \quad -10$

$2y^2 + 4y - 6 = 0$

$\frac{2}{2} \quad \frac{2}{2}$

$y^2 + 2y - 3 = 0$

$(y+3)(y-1) = 0$

$y+3=0 \qquad y-1=0$

$y=-3 \qquad y=1$

Now we have to find the "x"s. We have to find an equation to plug these 2 values of y in order to get our 'x's.

$x = 2+y$

If $y=-3$, then:	If $y=1$, then:
$x=-3+2$	$x=1+2$
$x=-1$	$x=3$
$(-1,-3)$	$(3,1)$

Now, we have to check both points in both equations

$(-1,-3)$ $(3,1)$

① $x-y=2$
$(-1)-(-3)=2$
$-1+3=2$
$2=2$ ✓

$x-y=2$
$(3)-(1)=2$
$3-1=2$
$2=2$ ✓

$(-1,3)$

② $x^2+y^2=10$
$(-1)^2+(3)^2=10$
$1+9=10$
$10=10$ ✓

$(3,1)$
$x^2+y^2=10$
$(3)^2+(1)^2=10$
$9+1=10$
$10=10$ ✓

So, we keep both points for our answer.

#8.6 20 Solve:

$\begin{cases} 7x^2+3y^2-49=0 & \text{times } 4 \\ 4x^2+4y^2=98 & \text{times } 3 \end{cases}$

Elimination → the goal is to create term opposites

$\begin{cases} 28x^2+12y^2-196=0 \\ 12x^2+12y^2=294 \end{cases}$ ← term opposites

Now, we add

$28x^2-12y^2-196=0$
$12x^2+12y^2=294$

$40x^2+0-196=294$
$40x^2-196=294$
$+196 \quad +196$

$\frac{40x^2}{40}=\frac{490}{40}$

$x^2=\frac{49}{4}$ *

(*) When all variable terms in your original equation, you can solve for x^2 or y^2, instead of x or y

~~Now, let's check:~~

Class chooses:

$x^2 = \frac{49}{4}$

This is, actually two numbers:

$+\frac{49}{4}$, $-\frac{49}{4}$

(2 values for x)

$$4x^2 + 4y^2 = 98$$

$$\cancel{4}\left(\frac{49}{\cancel{4}}\right) + 4y^2 = 98$$

$$49 + 4y^2 = 98$$

$$-49 \qquad -49$$

$$\frac{4y^2}{4} = \frac{49}{4}$$

$$\boxed{y^2 = \frac{49}{4}}$$

→ two numbers: $+\frac{49}{4}$, $-\frac{49}{4}$

(two values for y)

So, we'll have 4 points:

$\left(\frac{7}{2}, \frac{7}{2}\right)$, $\left(\frac{7}{2}, -\frac{7}{2}\right)$ $\left(-\frac{7}{2}, \frac{7}{2}\right)$ $\left(-\frac{7}{2}, -\frac{7}{2}\right)$

Check: Put $x^2 = \frac{49}{4}$ and $y^2 = \frac{49}{4}$ into $\boxed{1}$ and $\boxed{2}$

$\boxed{1}$ $7x^2 - 3y^2 - 49 = 0$

$$7\left(\frac{49}{4}\right) - 3\left(\frac{49}{4}\right) - 49 = 0$$

$$\underbrace{\frac{343}{4} - \frac{147}{4}} - 49 = 0$$

$$\frac{196}{4} - 49 = 0$$

$$49 - 49 = 0$$

$$0 = 0 \checkmark$$

12. $4x^2+4y^2=98$

$4\left(\frac{49}{4}\right)+4\left(\frac{49}{4}\right)=98$

$49+49=98$

$98=98$ ✓

So, we keep the four points for our answer.

#8.6.5 Solve by elimination:

$\begin{cases} y=x^2+4 & [1] \\ y=x^2+1 & [2] \end{cases}$ → times -1

$\begin{cases} y=x^2+4 \\ -y=-x^2-1 \end{cases}$ GOAL ACHIEVED

$0=0+3$

$0=3$ → no solution to this system (no points of intersection)