Lesson 9.3: Solving Systems of Non-linear Equations

Substitution Method:

- 1. Take one of the two equations and solve for either x or y
- 2. Substitute into the other equation
- Solve for the variable
- 4. Plug the answer in to any equation to find the other variable.

Elimination Method:

- Multiply one or both equations so that the coefficients match (it's easiest if one of the coefficents is negative)
- 2. Add the equations
- 3. Solve for the remaining variable
- 4. Plug the answer in to any equation to find the other variable.

EX 1:
$$\begin{cases} y = x^2 + 1 \\ y = 3x + 1 \end{cases}$$

$$3x+1 = x^2+1$$

$$O = \frac{x}{x}(x-3)$$

$$\begin{cases} y = \sqrt{x} \\ y = 2 - x \end{cases}$$

$$(2 - x)(2 - x)$$

$$(\sqrt{x})^{2} = (2 - x)^{2}$$

$$x = x^{2} - 4x + 4$$

$$0 = x^{2} - 5x + 4$$

$$(x - 1)(x - 4)$$

$$x = 1$$

$$y = \sqrt{1} = 1$$

$$y = \sqrt{4} = 2$$

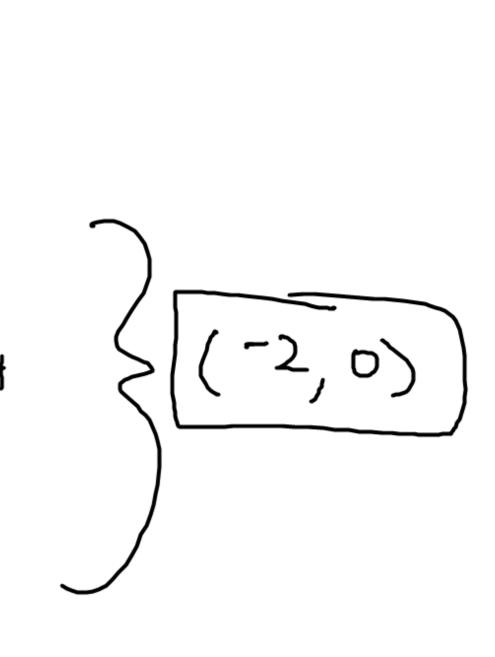
$$y = 2 - 4$$

$$4 = -2$$

Extraneas

EX3:
$$(x^{2} + y^{2}) = 4$$

 $-1(x^{2} + 2x + y^{2}) = 0$
 $x^{2} + y^{2} = 4$
 $+ y^{2} = 4$
 $+ -x^{2} - 2x - y^{2} = 0$
 $-2x = 4$
 $-2x = 4$



EX 4:
$$(y)^3 = (\sqrt[3]{x})^3 - y^3 = x$$

 $y^2 = 2y^3$
 $0 = 2y^3 - y^2$
 $0 = y^2(2y - 1)$
 $y = 0$
 $x = (\frac{1}{2})^2 = \frac{1}{8}$
 $(0,0)$
 $(\frac{1}{8},\frac{1}{2})$

$$\begin{cases} x^{2} + y^{2} = 10 \\ xy = 3 \\ y^{2} + y^{2} = 10 \end{cases}$$

$$(\frac{3}{3})^{2} + y^{2} = 10$$

$$(\frac{9}{4})^{2} + y^{2} = 10$$

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

 $y=-3, 3, -1, 1$
 $x=-1, 1, -3, 3$

$$\begin{cases} \ln x = 4 \ln y \\ \log_3 x = 2 + 2 \log_3 y \end{cases}$$

$$\begin{cases} \ln x = \ln y \\ \ln x = \ln y \end{cases}$$

$$\begin{cases} \ln x = 2 + 2 \log_3 y \\ \log_3 y = 2 + 2 \log_3 y \\ \log_3 y = 2 + 2 \log_3 y \\ \log_3 y = 2 + 2 \log_3 y \end{cases}$$

$$\begin{cases} \log_3 y = 2 + 2 \log_3 y \\ \log_3 y = 2 + 2 \log_3 y \\ \log_3 y = 2 + 2 \log_3 y \end{cases}$$

(#53 on HW)

$$3^{109_{3}}(y^{2}) = 3^{2}$$

$$y^{2} = 9$$

$$y = 3 = 3$$

$$x = (3)^{4} = 81$$

$$(81, 3)$$

41 egz y = 2+ 21053 y

2 log3 y = 2

log3 X argmant 1093 (27) = 3

$$\begin{cases} \log_x(2y) = 3 \\ \log_x(4y) = 2 \end{cases}$$

$$\begin{cases} \log_x(2y) = 2 \\ \log_x(2y) = 2 \end{cases}$$

Substitute
$$(4(\frac{x^3}{2})) = 2$$

 $\log_x (4(\frac{x^3}{2})) = 2$
 $\log_x (2x^3) = 2$
 $2x^3 = x^2$

$$\frac{\chi^{2}(2\chi-1)=0}{\chi^{2}(\chi^{2})}=0$$

$$\frac{\chi^{2}(\chi^{2})=1}{\chi^{2}(\chi^{2})}=0$$

$$\frac{\chi^{2}(\chi^{2})=1}{\chi^{2}(\chi^{2}$$

$$\begin{cases} x^{2} - xy - 2y^{2} = 0 \end{cases}$$

$$xy + x + 6 = 0$$

$$x + y - y + y + b = 0$$

$$-(y^{2} + y - b) = 0$$

$$-(y$$

Circle all solutions to the following systems of equation.

