Solve the Non-Linear System:

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

Solve for y in the 2nd equation: $y = -x + 4$

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Substitute $-x + 4$ in the place of y in the 1st equation: $x^2 + x - (-x + 4) = -1$

Solve the Quadratic Equation: $x^2 + 2x - 3 = 0$
$(x - 1)(x + 3) = 0 \rightarrow x = 1$ & $x = -3$.
Find the corresponding values for y: $y = -1 + 4 = 3$ & $y = 3 + 4 = 7$
The solutions are: $(1, 3)$ & $(-3, 7)$.

Solve the Non-Linear System:

$$\begin{cases} 2x^2 - 5x - y = -2 \\ \quad x^2 + 2x + y = 0 \end{cases}$$

Eliminate the y-terms by adding the two equations: $3x^2 - 3x = -2$
Solve the Quadratic Equation: $3x^2 - 3x + 2 = 0$

$$x = \frac{3 \pm \sqrt{9 - 4(3)(2)}}{6} = \frac{3 \pm \sqrt{-15}}{6}$$ Because the Discriminant is Negative, there is NO REAL SOLUTION

for x. Therefore the original system has NO SOLUTION.

Solve the Non-Linear System:

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

Substitute $-3x + 10$ from the 2nd equation for y in the 1st equation: $x^2 + (-3x + 10)^2 = 10$

Re-Write the Quadratic Equation: $x^2 + 9x^2 - 60x + 100 = 10 \rightarrow 10x^2 - 60x + 90 = 0$

Divide Both Sides by 10: $x^2 - 6x + 9 = 0$
Solve the Quadratic Equation: $(x - 3)(x - 3) = 0 \rightarrow x = 3$
Find the corresponding value for y: $y = -3(3) + 10 = 1$
The solution is: $(3, 1)$.

Solve each Non-Linear System

1. $\begin{cases} y = x + 5 \\ y = x^2 - x + 2 \end{cases}$

2. $\begin{cases} y = (x - 3)^2 + 5 \\ y = 5 \end{cases}$

3. $\begin{cases} x^2 + y^2 = 64 \\ y = -8 \end{cases}$

4. $\begin{cases} 2x^2 + 4x - y = -3 \\ -2x + y = -4 \end{cases}$

5. $\begin{cases} 2x - 3 = y + 5x^2 \\ y = -3x - 3 \end{cases}$

6. $\begin{cases} y + 16x - 22 = 4x^2 \\ 4x^2 - 24x + 26 + y = 0 \end{cases}$

7. $\begin{cases} 2x^2 - 3x - y = -5 \\ -x + y = 5 \end{cases}$

8. $\begin{cases} -3x^2 + 2x - 5 = y \\ -x + 2 = -y \end{cases}$

9. $\begin{cases} y = -x^2 - 6x - 10 \\ y = 3x^2 + 18x + 22 \end{cases}$

10. $\begin{cases} y = (x - 2)^2 \\ y = -x^2 + 4x - 2 \end{cases}$