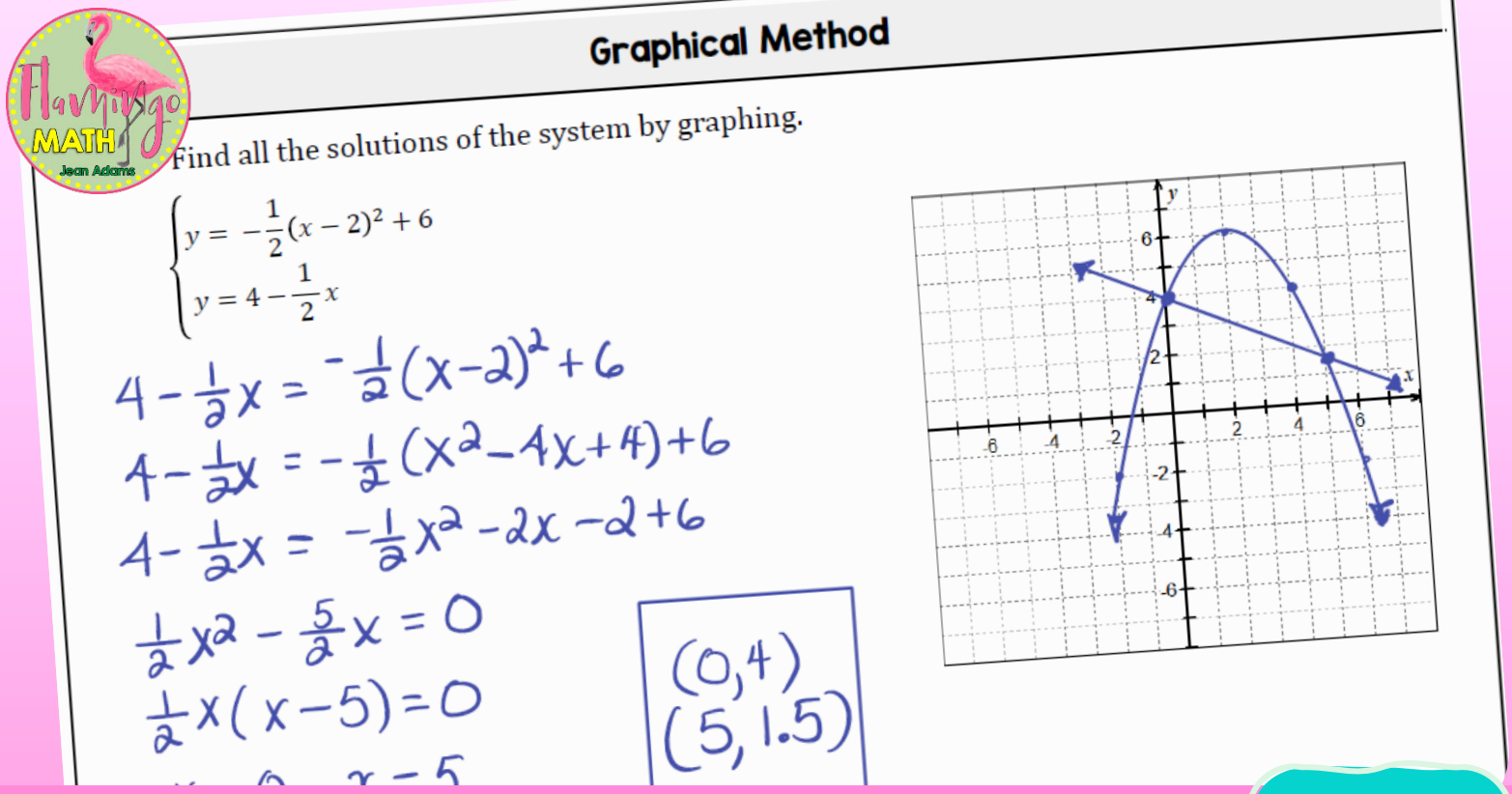
Precalculus Honors

Systems of Nonlinear Equations



Completely Editable 7.8

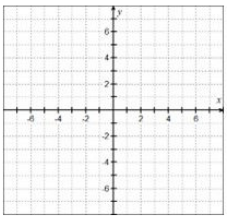
Lesson 7.8: Systems of Nonlinear Equations

Let's revisit systems of equations in which the equations are not linear. To solve a system of nonlinear equations, we can use graphing, substitution or elimination methods that we used in the earlier lessons for this unit.

Substitution and Elimination Methods

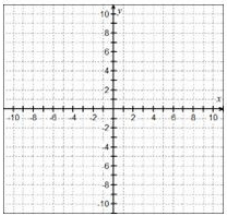
EX #1: Solve by substitution method.

$$\begin{cases} x^2 + y^2 = 25 \\ y = -2x - 5 \end{cases}$$



EX #2: Solve by elimination method.

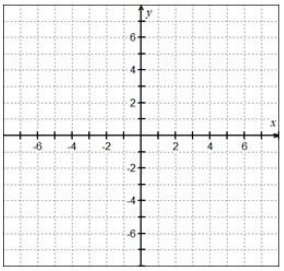
$$\begin{cases} 6x^2 + 5y = 9 \\ 3x^2 + 2y = 9 \end{cases}$$



Graphical Method

EX #3: Find all the solutions of the system by graphing.

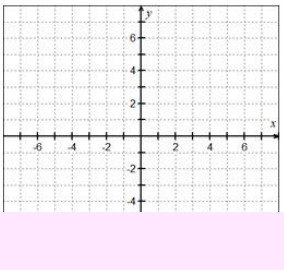
$$\begin{cases} y = -\frac{1}{2}(x-2)^2 + 6 \\ y = 4 - \frac{1}{2}x \end{cases}$$



Solving Systems with Technology

EX #4: Find all the solutions of the system, correct to three decimal places.

$$\begin{cases} x^2 + y^2 = 16 \\ y = 2x^2 - 6x \end{cases}$$



NOTES

7.8 **Systems of Nonlinear Equations Homework**

Name _____

Date _____ Period _____

Problems 1 – 2, solve the system by using the substitution method.

1. $\begin{cases} x^2 + y^2 = 100 \\ y = 3x \end{cases}$

2. $\begin{cases} 2x^2 + 3y = 17 \\ x^2 - y = 1 \end{cases}$

Problems 3 – 6, solve the system by using the elimination method.

3. $\begin{cases} x^2 + 4y^2 = 8 \\ 3x^2 - y^2 = 11 \end{cases}$

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

5. $\begin{cases} y = x^2 + 2x + 1 \\ y = 2x + 3 \end{cases}$

6. $\begin{cases} xy = 12 \\ x - y = 4 \end{cases}$

Problems 7 – 10, Find all solutions of the system of equations

7. $\begin{cases} y = x^2 - 4x \\ y = -2x^3 + x^2 + 14x \end{cases}$

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

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

10. $\begin{cases} y = x^2 - 3x + 1 \\ y = x^3 - 3x^2 + 1 \end{cases}$

Problems 11 – 12, Use a graphing utility to find all solutions of the system, rounded to 3 decimal places.

11. $\begin{cases} x^2 + y^2 = 25 \\ x - 3y = 2 \end{cases}$

12. $\begin{cases} x^2 - y^2 = 4 \\ y = x^2 + 2x - 8 \end{cases}$

Problems 13 – 15, Find all solutions of the system of equations

Free Response Questions

13. The difference between the squares of two numbers is 5. Twice the square of the first number increased by the square of the second number is 22. Find the numbers.

14. A planet's orbit follows the path described by $9x^2 + 3y^2 = 96$. A comet is approaching the planet and follows a parabolic path $y = x^2 - 4$. Find all solutions where the comet might intersect the orbiting planet.

Practice Sets

Lesson Warm-Ups

1. Solve by substitution: $\begin{cases} x^2 + y^2 = 25 \\ x - y = 1 \end{cases}$

2. Solve by addition method: $\begin{cases} x^2 + y^2 = 16 \\ x^2 - 2y = 8 \end{cases}$

Name _____ Date _____ Period _____

Lesson 7.8 Systems of Nonlinear Equations **Warm-Up # 2**

1. Solve by substitution: $\begin{cases} x^2 + y^2 = 25 \\ x + 1 = y \end{cases}$

2. Solve by addition method: $\begin{cases} x^2 + y^2 = 4 \end{cases}$

Daily Lesson Quiz

7.8 Systems of Nonlinear Equations **Form A**

Name _____

Date _____ Period _____

1. Solve the system using substitution method.
$\begin{cases} x^2 + y^2 = 13 \\ x + y = -1 \end{cases}$

2. Find all solutions of the system of equations.
$\begin{cases} x^2 + y^2 = 16 \\ x + y^2 = 4 \end{cases}$

3. Find all solutions of the system of equations.
$\begin{cases} x = y^2 \\ x - y = 6 \end{cases}$

Grade:

7.8 Systems of Nonlinear Equations **Form B**

Name _____

Date _____ Period _____

1. Solve the system using substitution method.
$\begin{cases} x^2 + y^2 = 13 \\ x - y = 1 \end{cases}$

2. Find all solutions of the system of equations.
$\begin{cases} x^2 + y^2 = 25 \\ x + y^2 = 5 \end{cases}$

3. Find all solutions of the system of equations.
$\begin{cases} x = y^2 \\ x - y = 12 \end{cases}$

Grade: