8.1 Solving Systems of Equations Graphically

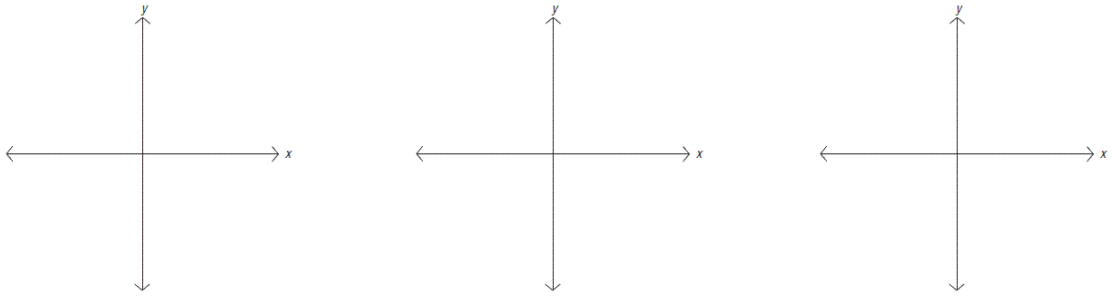
Linear Equations

- have a degree of _____
- graph as a _____
- examples:

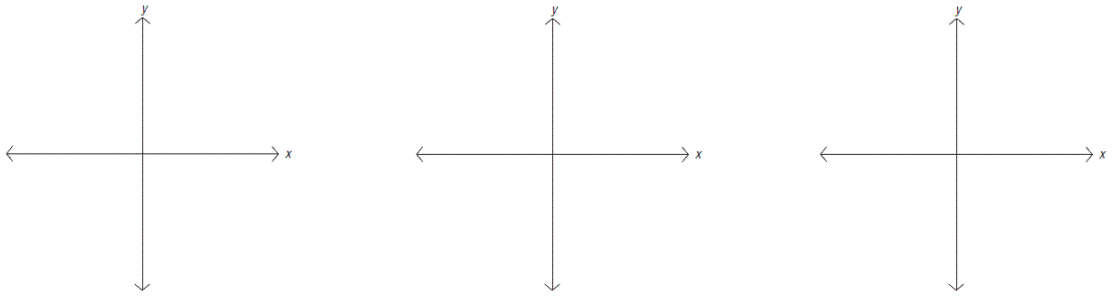
Quadratic Equations

- have a degree of _____
- graph as a _____
- examples:

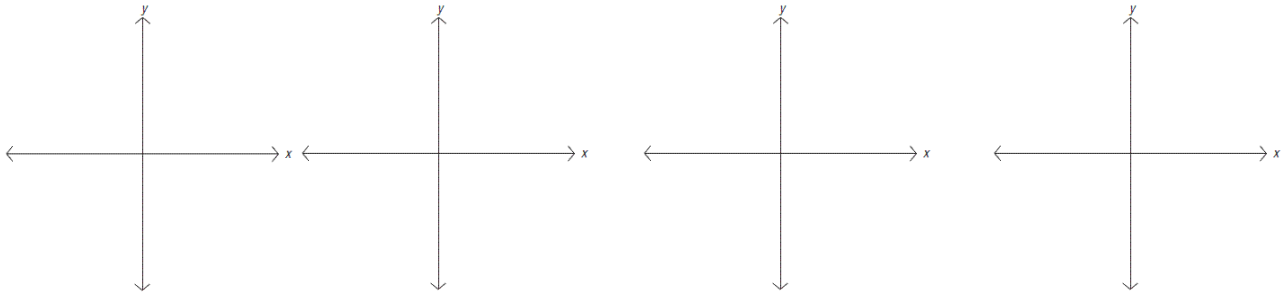
System of Linear Equations



System of Linear-Quadratic Equations



System of Quadratic-Quadratic Equations

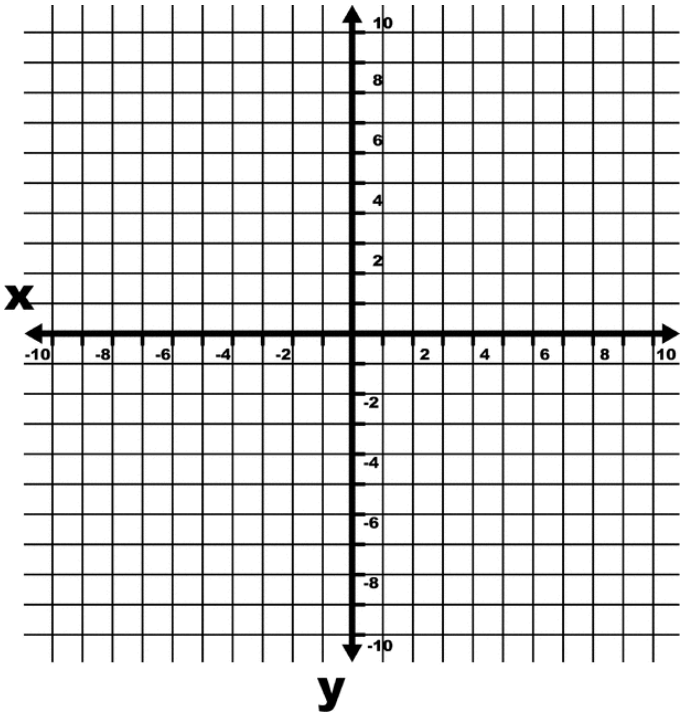


Concept#12- To solve a linear – quadratic or quadratic – quadratic system of equations graphically (with or without technology)

Example #1)a) What type of system of equations is represented? b)Solve the following system of equations graphically. c) verify your solution(s)

$4x - y + 3 = 0$

$2x^2 + 8x - y + 3 = 0$



Example #2) a) What type of system of equations is represented? b) Solve the following system of equations graphically using technology. c) verify your solution(s)

$2x^2 - 16x - y = -35$

$2x^2 - 8x - y = -11$

Example #3) Engineers use vertical curves to improve the comfort and safety of roadways. Vertical Curves are parabolic in shape and are used for transitions from one straight grade to another. Each grade line is tangent to the curve.

What does it mean for each grade line to be tangent to the curve?

Suppose surveyors model the first grade line for a section of road with the linear equation $y = -0.06x + 2.6$ **, the second grade line with the linear equation** $y = 0.09x + 2.35$ **, and the parabolic curve with the quadratic equation** $y = 0.0045x^2 + 2.8$ **a) Write the two systems of equations that would be used to determine the coordinates of the points of tangency.**

b) Using graphing technology, show the surveyors layout of the vertical curve and determine the points of tangency to the nearest hundredth

c) Interpret each point of tangency.

<u>8.1 Assignment</u>: Page 435 #4ad, 5cd,10 Using the graphing calculator or desmos. Sketch graphs and identify the solution(s). Use solution brackets. EXT.#16

<u>8.1 Assignment</u>: Page 435 # 2, 3,6, 7, 8(these questions do not need a graphing calculator)

8.2 Solving Systems of Equations Algebraically (Substitution)(Day 1)

3 Ways to solve systems of equations:

1. 2. 3.

To verify, check ALL answers in BOTH equations.

NOTE

- If 0x = 0 (a true statement), x can be anything, so there are an infinite number of solutions.
- If 0x = 5 (a false statement), there are NO solutions

Concept #13- To solve a linear - quadratic or quadratic – quadratic system of equations algebraically bv substitution or elimination.

Method 1: Substitution

- To solve a system of equations in two variables using substitution,
  - isolate one variable in one equation
  - substitute the expression into the other equation and solve for the remaining variable
  - substitute the value(s) into one of the original equations to determine the corresponding value(s) of the other variable
  - verify your answer by substituting into both original equations

Ex #1 Solve: $5x - y = 10$

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

Ex#2 Solve: $2x^2 + 4y = 15$

$4x^2 + 8y = 20$

Concept #14 : To solve situational problems involving system of linear and quadratic equations

Example #3) Determine two integers that have the following relationships: Fourteen more that twice the first integer gives the second integer. The second integer increased by one is the square of the first integer.

a) Write a system of equations that relates to the problem.
b) Solve the system algebraically

8.2 (Day 1) Assignment: Page 451 #1, 3ace,8,9,10

8.2 Solving Systems of Equations Algebraically (Elimination) (Day 2)

Concept #13- To solve a linear - quadratic or quadratic – quadratic system of equations algebraically by substitution or elimination.

Method 2: Elimination

Ex#1 Solve: $6x^2 – x – y = - 1$

$4x^2 – 4x – y = - 6$

- To solve a system of equations in two variables using elimination,
  - if necessary, rearrange the equations so that the like terms align
  - if necessary, multiply one or both equations by a constant to create equivalent equations with a pair of variable terms with opposite coefficients
  - add or subtract to eliminate one variable and solve for the remaining variable
  - substitute the value(s) into one of the original equations to determine the corresponding value(s) of the other variable
  - verify your answer(s) by substituting into both original equations

Ex#2 Solve: $3x^2 - x - y = 2$

$6x^2 - 2x - 2y = 4$

Concept #14 : To solve situational problems involving system of linear and quadratic equations

Example #3) During a basketball game Ben completes an impressive "alley-oop," with teammate Luke. The path of the ball thrown by Luke can be modelled by the equation $d^2 - 2d + 3h = 9$, where *d* is the horizontal distance of the ball from the centre of the hoop, in metres, and h is the height of the ball above the floor, in metres. The path of Ben's jump can be modelled by the equation $5d^2 - 10d + h = 0$, where d is the horizontal distance from the centre of the hoop, in metres, and h is the height if the hands above the floor, in metres.

a) **Solve the system of equations algebraically. Give your solution to the nearest hundredth.**
b) **Interpret your result. What assumptions are you making?**

8.2 (Day2) Assignment: Page 451 #4abe,5ac, 13

Extra Word Problems (Solve by Method of Choice)

Pre- Calc 20 (SUNDEEN) **Outcome P20.8** **Chapter 8 –Solving Systems of Equations**

8.2 Solving System of Equations Algebraically – Word Problems

Solve the following word problems using a system of equations (2 equations, 2 variables). Make sure you create let statements. Some of the problems are linear-quadratic and some are quadratic-quadratic. Do all work on a separate sheet of paper.

1. The sum of two numbers is 16, and the sum of their squares is 146. Find the numbers.
2. The sum of two numbers is 11 and the difference of their squares is 77. Find the numbers.
3. Two integers have a difference of -30. When the larger integer is increased by 3 and added to the square of the smaller integer, the result is 189. What are the integers?
4. Find two numbers such that the sum of their squares is 170 and the difference of their squares is 72.
5. Terri makes a good hit and the baseball travels on a path modelled by $h = -0.1x^2 + 2x$. Ruth is in the outfield directly in line with the path of the ball. She runs toward the ball and jumps to try to catch if. Her jump is modelled by the equation $h = -x^2 + 39x – 378$. In both equations, x is the horizontal distance in meters from home plate and h is the height of the ball above the ground on meters. Solve this system of equations algebraically and explain the meaning of the point of intersection. Round your answer to the nearest hundredth.
6. A piggy bank contains quarters and loonies. The total number of coins is 73. The total value of the coins is $37. How many of each type of coin is there?
7. Find the dimensions of a rectangle having perimeter 34 feet and a diagonal of length 13 feet.

Answers:

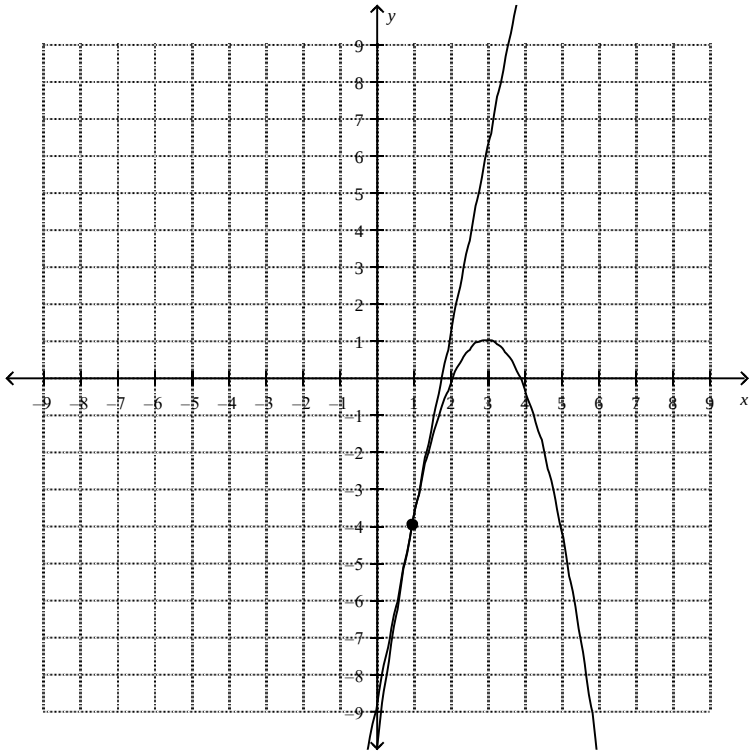
1. The numbers are 5 and 11 2. The numbers are 9 and 2 3. The integers are

12 and 42 or -13 and 17 4. The numbers are 11 and 7 or 11 and -7 or -11 and 7 or -11 and -7.

5. x = 18.96 m and h = 1.97 m 6. There are 25 loonies and 48 quarters

7. The dimensions are 5 ft by 12 ft

Ex./ What type of system of equations is represented? Give the solution(s) to the system.

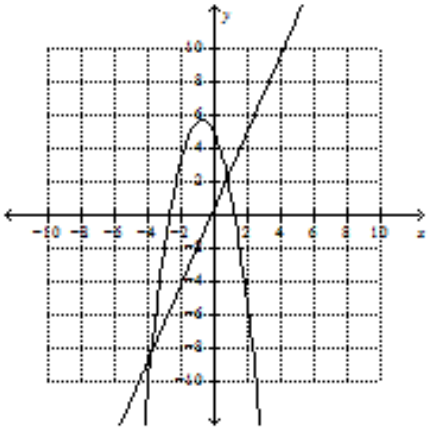


2. Which graph represents the system of equations shown below?

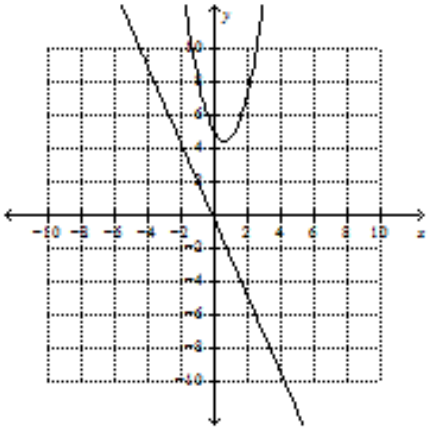
$y = -1.5x^2 - 2x + 5$

$y = 2.3x + 0.2$

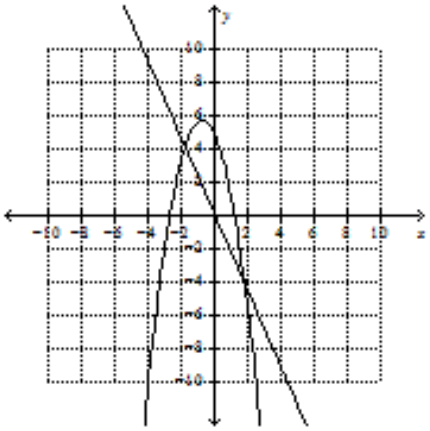
A



C



B



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