

# Systems of Linear Equations in two variables (4.1)

- Solve by graphing
- Solve using substitution
- Solve by elimination by addition
- Applications

# Warm-up

A restaurant serves two types of fish dinners- small for \$5.99 each and a large order for \$8.99.

One day, there were 134 total orders of fish and the total receipts for these 134 orders was \$1024.66. How many small orders and how many large fish plates were ordered?

# Systems of Two Equations in Two variables

Given the linear system

$$ax + by = c$$

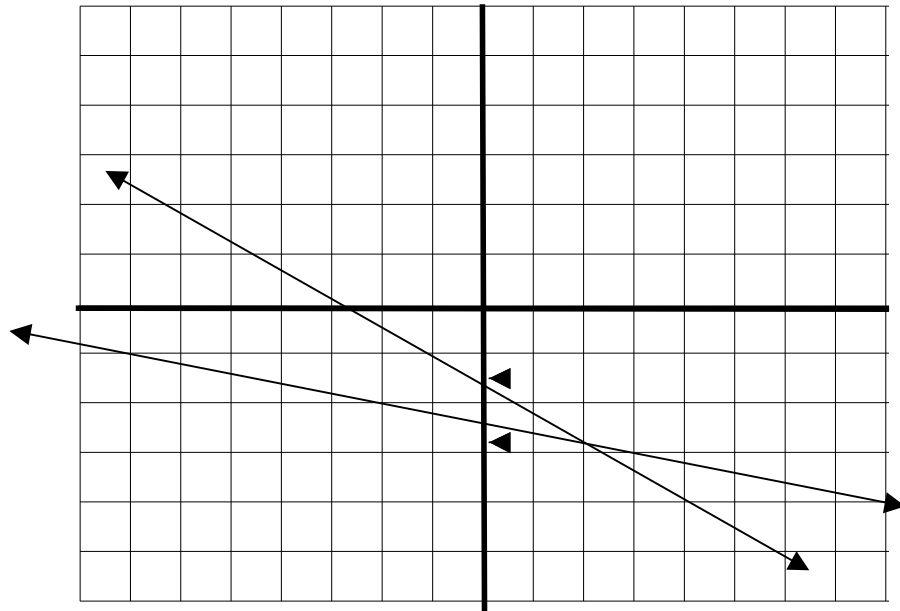
$$dx + ey = f$$

- A solution is an ordered pair  $(x_0, y_0)$  that will satisfy each equation
- The solution set is the set of all ordered pairs that satisfy both equations.

# Solve by graphing

$$3x + 5y = -9$$

$$x + 4y = -10$$



# Another example:

Now, you try one:

Solve the system by graphing:

$$2x+3 = y$$

$$x+2y = -4$$

# Method of Substitution

$$2x + 3 = y$$

$$x + 2y = -4$$

1. Solve one of the equations for either  $x$  or  $y$ .
2. Substitute that result into the other equation to obtain an equation in a single variable (either  $x$  or  $y$ ).
3. Solve the equation for that variable.
4. Substitute this value into any convenient equation to obtain the value of the remaining variable.

# Another example:

Solve the system using substitution:

$$3x - 2y = -7$$

$$y = 2x - 3$$

# Terminology:

- A **consistent** linear system is one that has one or more solutions.
  - A) If a consistent system has **exactly one solution** then the system is said to be **independent**. E.g.
    - What can you say about the slopes of the lines in this case?
  - B) if a consistent system has **more than one solution**, then the system is said to be **dependent**. E.g.
    - What can you say about the slopes of the lines in this case?
- An **inconsistent** linear system is one that has **no solutions**.
  - E.g.
    - What can you say about the slopes of the lines in this case?

# Elimination by Addition

$$2x - 7y = 3$$

$$-5x + 3y = 7$$

A better method is elimination by addition: We may do any of the following:

- 1) Two equations can be interchanged.
2. An equation is multiplied by a non-zero constant.
3. An equation is multiplied by a non-zero constant and then added to another equation.

# Elimination by Addition

- s:

# Solve using elimination by addition

Solve  $2x - 5y = 6$

$$-4x + 10y = -1$$

# Applications

A man walks at a rate of 3 miles per hour and jogs at a rate of 5 miles per hour. He walks and jogs a total distance of 3.5 miles in 0.9 hours. How long does the man jog?

## Now, solve the opening example:

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