Section 5.2 (Systems of Equations and Graphical Solutions)

Systems of equations are used in a variety of technical fields including electronics, engineering, physics; for us we'll use this algebra experience in both Statics and Strength of Materials (a civil engineering study) and in physics. It is essentially the study of two or more linear equations that are solved at the same time. We will focus on two equations with two variables but we will also explore three equations in three variables.

The objectives for this section include:

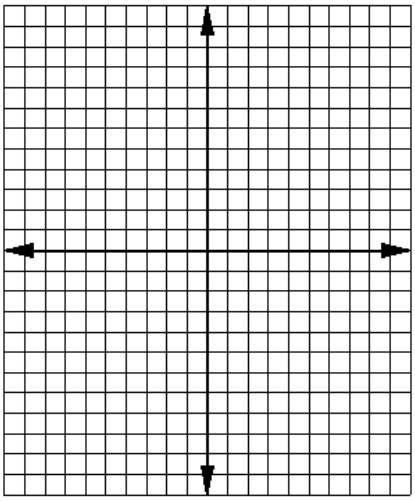
- Graph a system of linear equations
- Solve a system of linear equations graphically

To solve a pair of simultaneous linear equations, we graph the two equations on the same set of axes and determine the point of intersection. We write the solution as an ordered pair (x,y), together they are the solution to the system of two equations in two variables.

1. Graphically solve the system:

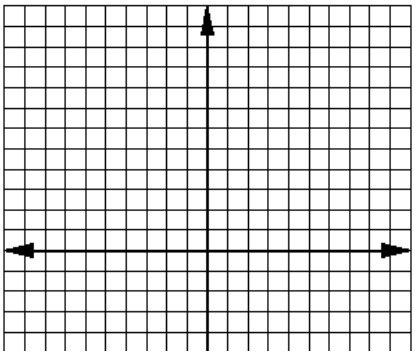
   $x + y = 5$

   $2x + y = 7$



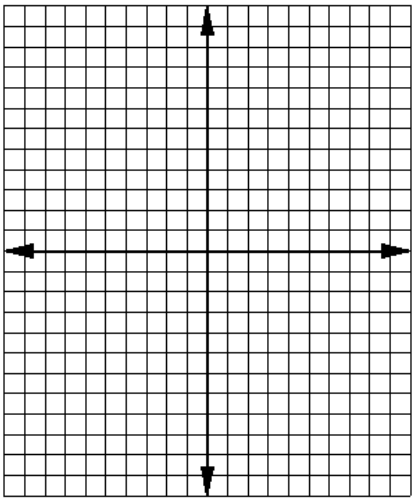
2. Graphically solve the system:

$$y = -\frac{1}{4}x + 1$$
$$2y = x - 4$$



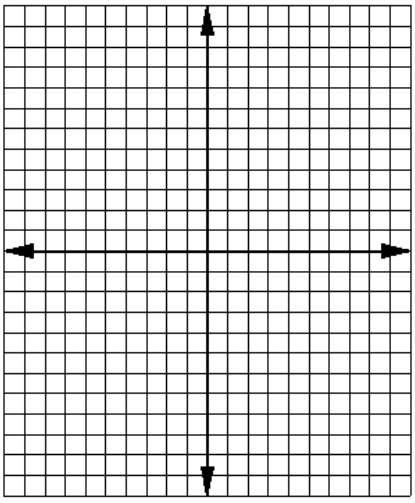
3. Graphically solve the system:

$$y = -3x + 5$$
$$3x + y = -2$$



4. Graphically solve the system:

$$3y - 2x = 6$$
$$-12y + 8x = -24$$



A system of equations is **"Consistent"** if it has a solution(s)

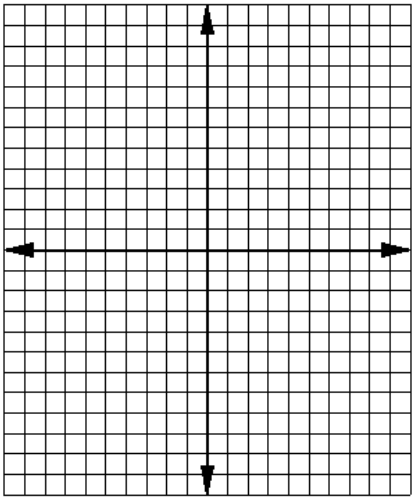
A system of equations is **"Inconsistent"** if it does not have a solution(s)

When a system of equations is represented by two lines that lie on top of one another, we say they are dependent on one another. They have an infinite number of solutions; we say the system is dependent.

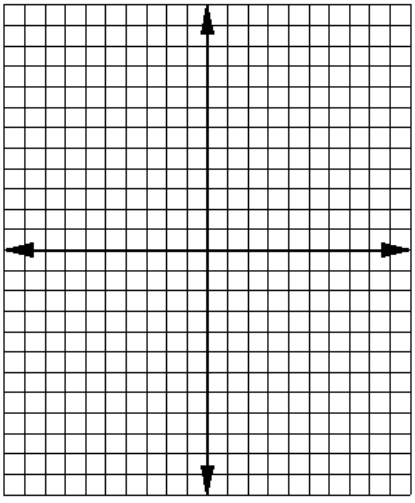
5. Graphically solve the system:

$$\frac{1}{3}x - 2y = 8$$

$$3x - \frac{1}{5}y = 2$$



6. Two angles are supplementary. One angle is 3 degrees less than twice the other. Find the measures of the angles.



7. A current of 2 A passes through a resistor R_1 and a current of 3 amps passes through a resistor R_2, the total voltage across the resistors is 8 volts. Then the current in the first resistor is changed to 4 amps and that in the second resistor is change to 1 amp; the total voltage is 11 volts. The resistances (in ohms) can be found by solving the equations.

$2R_1 + 3R_2 = 8$

$4R_1 + R_2 = 11$