SYSTEMS OF EQUATIONS

Classifying Systems

Consistent
Has at least one solution

Inconsistent
NO solution

Independent
Has exactly one sol'n

Dependent
infinite sol'n

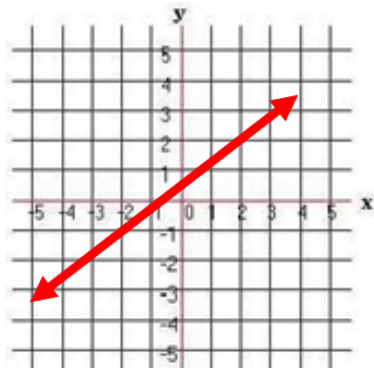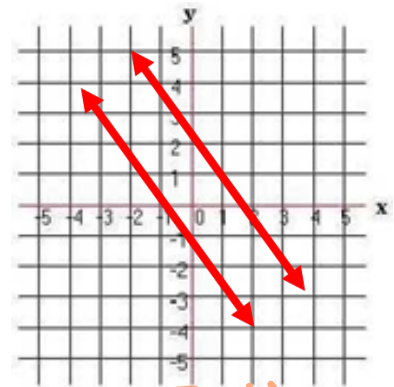## Consistent
Independent
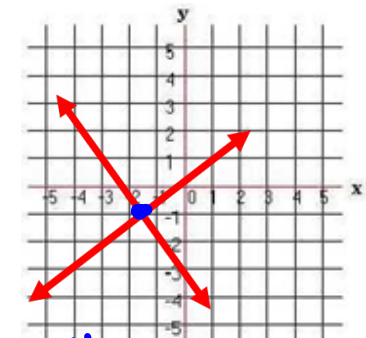
Sol'n (x, y)

Consistent
Dependent

infinite Sol'n

Both eg. graph
the same line
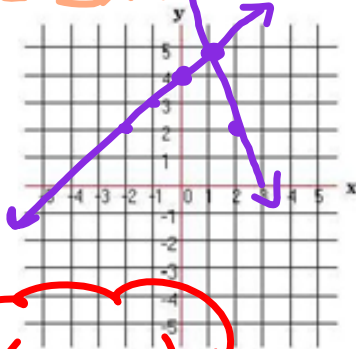
Inconsistent

No Sol'n
Parallel lines

Examples

① Graphing

$x - y = -4$

$3x + y = 8$

$y = x + 4$

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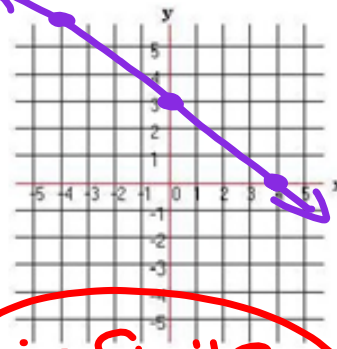
$\frac{1}{1} = \frac{-1}{-1}$

$\frac{-3}{1}$

$3x + 4y = 12$

$y = -\frac{3}{4}x + 3$

$4y - 12 = -3x$

$y = -\frac{3}{4}x + 3$

$-\frac{3}{4} = \frac{3}{-4}$

(1, 5)

infinite soln

① $y = mx + b$

② Graph
* y-int 1st
then count
slope

③ write
the answ.
as an
ordered
pair

② Substitution

Example

$x + 2y = 8 \quad -2y$

$\dfrac{1}{2}x - y = 18$

$x = \boxed{-2y + 8}$

$\dfrac{1}{2}(-2y + 8) - y = 18$

$-y + 4 - y = 18$

$-2y + 4 = 18$
$ -4$

$\dfrac{-2y}{-2} = \dfrac{14}{-2}$

$\boxed{y = -7}$

$x + 2y = 8$

$x + 2(-7) = 8$

$x - 14 = 8$
$ +14$

$\boxed{x = 22}$

$\boxed{(22, -7)}$

① Solve one of the eq. for either x or y.

② Plug the answ to #1 into the other eq.

③ Solve for the variable

④ Plug back into an original eq & Solve for the other variable

⑤ Write answ as ordered pair

Examples

$2(9x - 6y = 24)$

$-3(6x - 4y = 16)$

$18x - 12y = 48$

$-18x + 12y = -48$

$\overline{}$

$0 = 0$

infinite

consistent dep.

$*2(3x + 4y = 12)$

$6x + 8y = -16$

$-6x - 8y = -24$

$\overline{}$

$0 = -40$

No Sol'n

inconsistent

③ Elimination

Examples

$$4x + 2y = 15$$

$$-1(2x + 2y = 7)$$

① Multiply one or both eq. to force a variable to cancel

$4x + 2y = 15$
$-2x - 2y = -7$

② Add the eq. (collect like terms)

$$\frac{2x}{2} = \frac{8}{2}$$

③ Solve

$$x = 4$$

④ Plug answ into an orig eq & Solve

$4x + 2y = 15$
$4(4) + 2y = 15$

$16 + 2y = 15$
-16
$\frac{2y}{2} = \frac{-1}{2}$

$y = \frac{1}{2}$

$$\left(4, -\frac{1}{2}\right)$$