Solving a System Algebraically by **Elimination** (Addition)

ex) $2x + 3y = -4$
$+1y - 2x = 8$

Steps:

1. Make sure the x, y and constant terms line up with each other (the equal sign should line up too!)

$2x + 3y = -4$
$-2x + 1y = 8$

2. Find the pair that are the same coefficient (could be either x or y). The signs should be **different**. If they are not, multiply one equation by -1 to change all of the signs.

must equal 0 →

$2x + 3y = -4$
$-2x + 1y = 8$

3. Add the two equations together to eliminate one of the variables (x or y).

$2x + 3y = -4$
$+ \quad -2x + 1y = 8$
$0 \quad 4y = 4$

4. Use algebra to solve for the remaining variable.

$\frac{4y}{4} = \frac{4}{4}$
$y = 1$

5. Plug the variable back into one of the equations and use algebra again to solve for the other variable.

$y - 2x = 8$
$1 - 2x = 8$
$-2x = 7$

$\frac{-2x}{-2} = \frac{7}{-2}$
$x = -\frac{7}{2}$

6. Write your final answer as a point (x, y).

$\left(-\frac{7}{2}, 1\right)$

ex) $2x = 5y + 2$
$5y = x - 1$

$2x = 5y + 2$
$+\ -x = -5y - 1$
$x = 1$

$2x = 5y + 2$
$2(1) = 5y + 2$
$2 - 2 = 5y + 2 - 2$
$0 = 5y$
$\frac{0}{5} = \frac{5y}{5}$
$y = 0$
$\therefore (1, 0)$

ex) $5x - 2y = 5$
$-x + 2y = -9$

$4x = -4$
$\frac{4x}{4} = \frac{-4}{4}$
$x = -1$

$5x - 2y = 5$
$-5 - 2y = 5$
$+5 \quad +5$
$-2y = 10$
$\frac{-2y}{-2} = \frac{10}{-2}$
$y = -5$
$(-1, -5)$

ex) $-3x + 6y = -12$
$3x - y = 2$

$5y = -10$
$\frac{5y}{5} = \frac{-10}{5}$
$y = -2$

$3x - y = 2$
$3x - (-2) = 2$
$3x + 2 = 2$
$3x = 0$
$x = 0$
$(0, -2)$

ex) $x - 1 - 5y = 0$
$8 - 5y - 2x = 0$

$-x + 1 - 5y = 0$
$-2x + 8 - 5y = 0$
$-3x + 9 = 0$
$-9 \quad -9$
$-3x = -9$
$\frac{-3x}{-3} = \frac{-9}{-3}$
$x = 3$

$3 - 1 - 5y = 0$
$2 - 5y = 0$
$-2 \quad -2$
$-5y = -2$
$\frac{-5y}{-5} = \frac{-2}{-5}$
$y = \frac{2}{5}$
$(3, \frac{2}{5})$