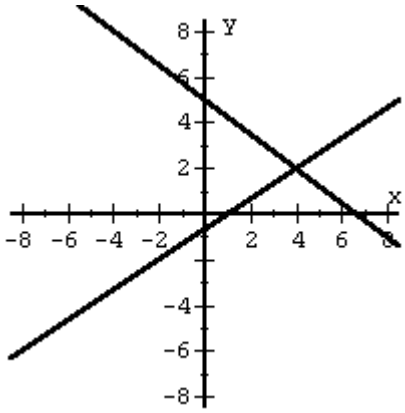
Solving Systems of Equations

Case 1: One Solution: Independent System **Addition / Elimination Method**

Graphing Method

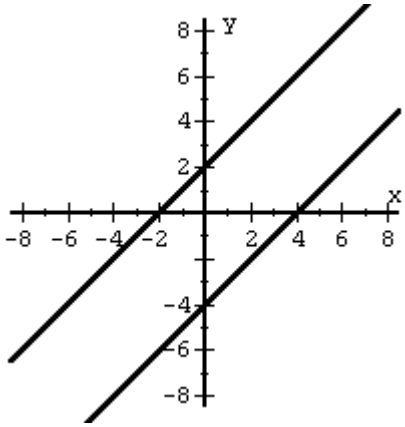


$$\begin{array}{lll} & \Downarrow & \\ 2x - 3y = 2 & \times 4 & \\ 3x + 4y = 20 & \times 3 & \end{array}$$

$$\begin{array}{r} 8x - 12y = 8 \\ 9x + 12y = 60 \\ \hline 17x = 68 \\ x = 4 \\ 3x + 4y = 20 \\ 3(4) + 4y = 20 \\ 4y = 8 \\ y = 2 \end{array}$$

Conclusion : $x = 4,\ y = 2$

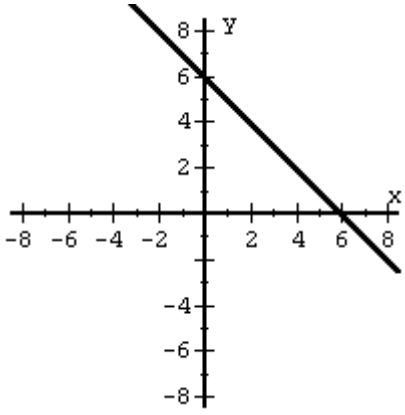
Case 2: No Solution: Inconsistent System **Substitution Method**



$$\begin{array}{lll} y = x + 2 & \rightarrow & y = (x + 2) \\ x - y = 4 & \rightarrow & x - y = 4 \\ & & x - (x + 2) = 4 \\ & & x - x - 2 = 4 \\ \text{A Contradiction} & \rightarrow & -2 = 4 \end{array}$$

Conclusion: No Solution

Case 3: Infinite Number of Solutions: Dependent System



Addition / Elimination Method

$$\begin{array}{lll} x + y = 6 & \rightarrow & x + y = 6 \times 1 \\ x = 6 - y & \rightarrow & x + y = 6 \times (-1) \end{array}$$

$$\begin{array}{r} x + y = 6 \\ -x - y = -6 \\ \hline 0 + 0 = 0 \end{array}$$

An Identity $\rightarrow$ $0 = 0$

Conclusion : Dependent System

All points on the line: $x + y = 6$