SIMULTANEOUS EQUATIONS 1

Solve the following simultaneous equations:

1) $\left.\begin{array}{l} 8x - 6y = 2 \\ 2x + 4y = 6 \end{array}\right\}$

2) $\left.\begin{array}{l} x + 2y = 5 \\ 2x + y = 7 \end{array}\right\}$

3) $\left.\begin{array}{l} \dfrac{1}{3x + 2y} = 1 \\ \dfrac{1}{3y - 2x} = -\dfrac{1}{7} \end{array}\right\}$

4) $\left.\begin{array}{l} \dfrac{x + y}{2} - \dfrac{x - y}{3} = 3 \\ \dfrac{x + 2y}{3} - \dfrac{x - 2y}{4} = 3 \end{array}\right\}$

5) $\left.\begin{array}{l} 4x - 7y = 3 \\ -8x + 14y = 5 \end{array}\right\}$

6) $\left.\begin{array}{l} 15x + 5y = -8 \\ -9x - 3y = \dfrac{24}{5} \end{array}\right\}$

SOLUTION

1) $\left.\begin{matrix} 8x-6y=2 \\ 2x+4y=6 \end{matrix}\right\} \rightarrow \left.\begin{matrix} 4x-3y=1 \\ x+2y=3 \end{matrix}\right\} \rightarrow x=3-2y \Rightarrow 4(3-2y)-3y=1$

$12-8y-3y=1 \Rightarrow -11y=-11 \Rightarrow y=1 \rightarrow x=3-2=1$ **Solution: x = 1, y = 1**

CONSISTENT INDEPENDENT SYSTEM

2) $\left.\begin{matrix} x+2y=5 \\ 2x+y=7 \end{matrix}\right\} \rightarrow \left.\begin{matrix} x+2y=5 \\ (\times(-2))-4x-2y=-14 \end{matrix}\right\} -3x=-9 \Rightarrow x=3$

$x+2y=5 \Rightarrow 3+2y=5 \Rightarrow y=1$ **Solution: x = 3, y = 1**

CONSISTENT INDEPENDENT SYSTEM

3) $\left.\begin{matrix} \dfrac{1}{3x+2y}=1 \\ \dfrac{1}{3y-2x}=-\dfrac{1}{7} \end{matrix}\right\} \rightarrow \left.\begin{matrix} 1=3x+2y \\ 7=-3y+2x \end{matrix}\right\} \rightarrow \left.\begin{matrix} 3x+2y=1 \\ 2x-3y=7 \end{matrix}\right\} \rightarrow \left.\begin{matrix} \times 2 \rightarrow 6x+4y=2 \\ \times(-3) \rightarrow -6x+9y=-21 \end{matrix}\right\}$

$13y=-19 \Rightarrow y=-\dfrac{19}{13} \rightarrow 3x+2\left(-\dfrac{19}{13}\right)=1 \Rightarrow 3x=1+\dfrac{38}{13} \rightarrow x=\dfrac{17}{13}$

Solution: x = 17/13, y = -19/13

CONSISTENT INDEPENDENT SYSTEM

4) $\left.\begin{matrix} \dfrac{x+y}{2}-\dfrac{x-y}{3}=3 \\ \dfrac{x+2y}{3}-\dfrac{x-2y}{4}=3 \end{matrix}\right\} \rightarrow \left.\begin{matrix} 3x+3y-2x+2y=18 \\ 4x+8y-3x+6y=36 \end{matrix}\right\} \rightarrow \left.\begin{matrix} x+5y=18 \\ x+14y=36 \end{matrix}\right\}$

$E_2-E_1 \rightarrow 9y=18 \Rightarrow y=2 \rightarrow x+10=18 \Rightarrow x=8$

Solution: x = 8, y = 2

CONSISTENT INDEPENDENT SYSTEM

5) $\left.\begin{matrix} 4x-7y=3 \\ -8x+14y=5 \end{matrix}\right\} \rightarrow \left.\begin{matrix} \times 2 \rightarrow 8x-14y=6 \\ -8x+14y=5 \end{matrix}\right\} \Rightarrow 0x+0y=11$

NO Solution

INCONSISTENT SYSTEM

6) $\left.\begin{array}{l} 15x+5y=-8 \\ -9x-3y=\dfrac{24}{5} \end{array}\right\} \rightarrow \left.\begin{array}{l} 15x+5y=-8 \\ -45x-15y=24 \end{array}\right\} \rightarrow \left.\begin{array}{r} 15x+5y=-8 \\ (\div 3)\ -15x-5y=8 \end{array}\right\} \Rightarrow 0x+0y=0$

Infinite solutions

CONSISTENT DEPENDENT SYSTEM