substitution

$(-12, -2)$

$$\begin{cases} 3x + 2y = -40 \\ x = 5y - 2 \end{cases}$$

$3(5y-2)+2y=-40$

$15y-6+2y=-40$

$17y-6=-40$

$+6 \quad +6$

$\frac{17y}{17} = \frac{-34}{17}$

$y = -2$

$x = 5(-2) - 2$

$x = -10 - 2$

$x = -12$

check $3(-12)+2(-2)=-40$

$-36 \quad -4 \quad = -40$

$-40 = -40$ ✓

Elimination $\Leftrightarrow$ linear combination

$\Downarrow$ get rid of a variable

$\Downarrow$ multiply by a constant & add

$\Rightarrow$ $\begin{cases} 3x+5y = 41 \\ (-1)(3x-2y) = (13)(-1) \end{cases}$

(7,4)

$3x+5y = 41$

$-3x+2y = -13$

$7y = 28$

$\frac{7y}{7} = \frac{28}{7}$

$y = 4$

$3x+5(4)=41$

$3x+20=41$

$3x=21$

$x=7$

Check

$3(7)-2(4)=13$

$21-8=13$

$13=13$ ✓

$5(4x+3y)=(16)5$

$-4(5x-7y)=(-66)(-4)$

$20x+15y=80$

$-20x+28y=264$

$43y=344$

$\frac{43y}{43}=\frac{344}{43}$

$y=8$

$4x+3(8)=16$

$4x+24=16$

$4x=-8$

$x=-2$

$(-2,8)$

$7(4x+3y)=(16)7$

$3(5x-7y)=(-66)3$

$28x+21y=112$

$15x-21y=-198$

$43x=-86$

$\frac{43x}{43}=\frac{-86}{43}$

$x=-2$

$5(-2)-7y=-66$

$-10-7y=-66$

$+10\quad+10$

$-7y=-56$

$\frac{-7y}{-7}=\frac{-56}{-7}$

$y=8$

Substitution

(-5, -2)

$3x - 5y = -5$

$x = 4y + 3$

$3(4y+3) - 5y = -5$

$12y + 9 - 5y = -5$

$7y + 9 = -5$

$-9 \quad -9$

$\frac{7y}{7} = \frac{-14}{7}$

$y = -2$

$x = 4(-2) + 3$

$x = -8 + 3$

$x = -5$

check

$3(-5) - 5(-2) = -5$

$-15 + 10 = -5$

$-5 = -5$ ✓

Elimination ⟺ linear combination

⇓ get rid of a variable

⇓ mult by a number & add

$-2(3x+5y)=(7)(-2)$

$6x-3y=27$

$-6x-10y=-14$

$6x-3y=27$

$-13y=13$

$\frac{-13y}{-13}=\frac{13}{-13}$

$y=-1$

$3x+5(-1)=7$

$3x-5=7$

$+5 \quad +5$

$\frac{3x}{3}=\frac{12}{3}$

$x=4$

$(4,-1)$

$3(3x+5y)=(7)3$

$5(6x-3y)=(27)5$

$9x+15y=21$

$30x-15y=135$

$\frac{39x}{39}=\frac{156}{39}$

$x=4$

$6(4)-3y=27$

$24-3y=27$

$-24 \quad -24$

$-3y=3$

$y=-1$

check

$6(4)-3(-1)=27$

$24+3=27$

$27=27$ ✓

Substitution

$x = 4y - 3$

$3x - 5y = -22$

$3(4y-3) - 5y = -22$

$12y - 9 - 5y = -22$

$7y - 9 = -22$

$+9 \quad +9$

$\frac{7y}{7} = \frac{-13}{7}$

$y \approx -1.857$

$x = 4(-1.857) - 3$

$x = -10.428$

Check

$3(-10.428) - 5(-1.857) = -22$

$-22 = -22$ ✓

$(-10.428, -1.857)$

Elimination ⟺ Linear Combination

⇓ ⇓

Get rid of one variable mult by a number & add.

~~4(2) − 3(3) = 8 − 9 = −1 ✓~~

$-3(4x-3y) = (-1)(-3)$ $7(4x-3y) = (-1)(7)$

$12x+7y = 45$ $3(12x+7y) = (45)3$

$-12x+9y = 3$ $28x-21y = -7$

$12x+7y = 45$ $36x+21y = 135$

$16y = 48$ $64x = 128$

$\frac{16y}{16} = \frac{48}{16}$ $\frac{64x}{64} = \frac{128}{64}$

$y = 3$ $x = 2$

(2, 3)

$12x+7(3)=45$

$12x+21=45$

$-21 \quad -21$

$\frac{12x}{12} = \frac{24}{12}$

$x = 2$

$4(2)-3y=-1$

$8-3y=-1$

$-8 \quad -8$

$-3y=-9$

$y=3$