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6.2 Substitution

Solve the following systems using the substitution method.

$$1) \begin{aligned} 0 &= x - 4 - y \\ 3x + y &= -8 \end{aligned}$$

$$\begin{aligned} -3x &\quad -3x \\ 5y &= -3x - 8 \\ 0 &= x - 4 - (-3x - 8) \\ 0 &= x - 4 + 3x + 8 \\ 0 &= 4x + 4 \\ -4 &= 4x \\ x &= -1 \\ 0 &= (-1) - 4 - y \\ 0 &= -5 - y \\ y &= -5 \\ (-1, -5) \end{aligned}$$

$$2) \begin{aligned} -m + 5n &= -18 \rightarrow m = 5n + 18 \\ -13 &= 2m - 3n \end{aligned}$$

$$\begin{aligned} -13 &= 2(5n + 18) - 3n \\ -13 &= 10n + 36 - 3n \\ -36 & \quad -3n \\ -49 &= 7n \\ n &= -7 \\ (-17, -7) \\ -13 &= 2m - 3(-7) \\ -13 &= 2m + 21 \\ -21 & \quad -21 \\ -34 &= 2m \\ m &= -17 \end{aligned}$$

$$3) \begin{cases} \frac{1}{3}x + \frac{5}{6}y = 1 \\ -\frac{1}{2}x - y = 1 \end{cases} \begin{aligned} 2x + 5y &= 6 \\ -x - 2y &= 2 \\ x &= -2y - 2 \end{aligned}$$

$$4) \begin{cases} \frac{1}{3}x + \frac{2}{3}y = 12 \\ x + 2y = 36 \end{cases} \begin{aligned} x + 9y &= -6 \\ x &= -9y - 6 \\ y &= -6 \end{aligned}$$

$$\begin{aligned} 2(-2y - 2) + 5y &= 6 \\ y &= 10 \\ 2x + 5(10) &= 6 \\ 2x + 50 &= 6 \\ x &= -22 \\ (-22, 10) \end{aligned}$$

$$x + 2(-6) = 36$$

$$x + 12 = 36 \\ x = 48$$

$$(48, -6)$$