Algebra 9.1 Systems of Equations

Solve the following systems of equations using substitution

$\begin{cases} y = x^2+1 \\ x+y=3 \end{cases} \Rightarrow x+x^2+1=3 \Rightarrow x^2+x-2=0 \Rightarrow (x+2)(x-1)=0$

$x=-2,1$

$y=x^2+1 \Rightarrow y=(-2)^2+1 \quad y=(1)^2+1$

$y=5 \qquad y=2$

write your final answer as coordinates

$\boxed{(-2,5),(1,2)}$ ← note: these points are where the lines intersect

Solve the following systems of equations using substitution

$\begin{cases} x-y^3=1 \Rightarrow \text{rewrite to get } x \text{ by itself} \Rightarrow x=y^3+1 \\ 2x=9y^2+2 \Rightarrow 2(y^3+1)=9y^2+2 \Rightarrow 2y^3+2=9y^2+2 \end{cases}$

$2y^3-9y^2=0$

$y^2(2y-9)=0$

$x=y^3+1$

$x=(0)^3+1 \quad x=(9/2)^3+1$

$x=1 \qquad x=\frac{729}{8}+1=\frac{737}{8}$

$y^2=0 \quad 2y-9=0$

$y=0 \quad y=9/2$

$(1,0),\left(\frac{737}{8},\frac{9}{2}\right)$

Solve the following systems of equations using substitution

$\begin{cases} x^2+y^2=25 \\ 3x+4y=-25 \Rightarrow 4y=-3x-25 \Rightarrow y=\frac{-3x-25}{4} \end{cases}$

$x^2+\left(\frac{-3x-25}{4}\right)^2=25 \Rightarrow x^2+\frac{9x+150x+625}{16}=25 \Rightarrow 16x^2+9x^2+150x+625=400$

$25x^2+150x+225=0 \Rightarrow 25(x^2+6x+9)=0 \Rightarrow 25(x+3)(x+3)=0 \Rightarrow x=-3$

$y=\frac{-3x-25}{4} \quad y=\frac{-3(-3)-25}{4} \quad y=\frac{-16}{4} \quad y=4$

$\boxed{(-3,-4)}$

Algebra 9.1 cont

Solve the following systems of equations using substitution

$$\begin{cases} xy = 2 \\ 6x - y + 4 = 0 \end{cases}$$

$xy = 2 \Rightarrow x = \frac{2}{y}$

$6\left(\frac{2}{y}\right) - y + 4 = 0$

$12 - y^2 + 4y = 0$

$-y^2 + 4y + 12 = 0$

$y^2 - 4y - 12 = 0$

$(y-6)(y+2) = 0$

$y = 6, -2$

$x = \frac{2}{y}$

$x = \frac{2}{6}$ $\quad x = \frac{2}{-2}$

$x = \frac{1}{3}$ $\quad x = -1$

$\boxed{\left(\frac{1}{3}, 6\right), (-1, -2)}$

Solve the following system of equations using substitution

$$\begin{cases} x^2 + 3y^2 = 13 \\ x^2 - y^2 = 12 \end{cases}$$

$x^2 - y^2 = 12 \Rightarrow x^2 = y^2 + 12$

$y^2 + 12 + 3y^2 = 13$

$4y^2 = 1$

$y^2 = \frac{1}{4}$

$y = \pm \frac{1}{2}$

$x^2 = y^2 + 12$

$x^2 = \left(\frac{1}{2}\right)^2 + 12$ $\quad x^2 = \left(-\frac{1}{2}\right)^2 + 12$

$x^2 = \frac{1}{4} + \frac{48}{4}$ $\quad x^2 = \frac{1}{4} + \frac{48}{4}$

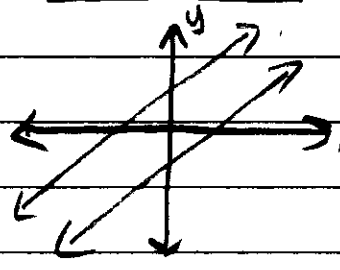
$x^2 = \frac{49}{4}$ $\quad x^2 = \frac{49}{4}$

$x = \pm \frac{7}{2}$ $\quad x = \pm \frac{7}{2}$

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

Inconsistent system

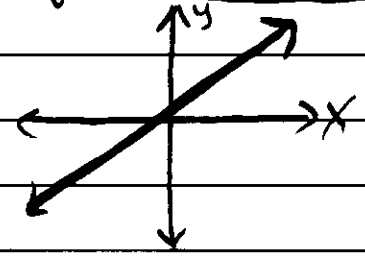
no solution



two parallel lines, never intersecting

Dependent system

infinite solutions



two overlapping lines, all points of each line intersect with the other