

Quadrilaterals – Solving by Substitution

Homework Section 6.1

Name _____

Solve each system of equations by substitution. If the system does not have exactly one solution, state whether it has no solution or infinitely many solutions.

#1)
$$\begin{cases} x = 3 \\ 2y + x = 3 \end{cases} \rightarrow x = 3$$

$$\rightarrow 2y + (3) = 3$$

$$2y = 0$$

$$y = 0$$

$(3, 0)$

#2)
$$\begin{cases} y = 2 \\ 2x - 4y = 1 \end{cases} \rightarrow y = 2$$

$$\rightarrow 2x - 4(2) = 1$$

$$2x - 8 = 1$$

$$2x = 9$$

$$x = \frac{9}{2}$$

$(\frac{9}{2}, 2)$

#3)
$$\begin{cases} y = 2x - 7 \\ 3x - y = 7 \end{cases} \rightarrow y = 2x - 7$$

$$y = 2(0) - 7$$

$$y = 0 - 7$$

$$y = -7$$

$$\rightarrow 3x - (2x - 7) = 7$$

$$3x - 2x + 7 = 7$$

$$x + 7 = 7$$

$$x = 0$$

$(0, -7)$

#4)
$$\begin{cases} y = x + 3 \\ 2y + 2x = 4 \end{cases} \rightarrow y = x + 3$$

$$y = (-\frac{1}{2}) + 3$$

$$y = -\frac{1}{2} + \frac{6}{2}$$

$$y = \frac{5}{2}$$

$$\rightarrow 2(x + 3) + 2x = 4$$

$$2x + 6 + 2x = 4$$

$$4x + 6 = 4$$

$$4x = -2$$

$$x = -\frac{1}{2}$$

$(-\frac{1}{2}, \frac{5}{2})$

#5)
$$\begin{cases} x + y = 16 \\ 2y = -2x + 2 \end{cases} \rightarrow y = -x + 1$$

$$\rightarrow x + (-x + 1) = 16$$

$$1 \neq 16$$

NO Solution!

#6)
$$\begin{cases} x = 2y \\ .25x + .5y = 10 \end{cases} \rightarrow x = 2y$$

$$x = 2(10)$$

$$x = 20$$

$$\rightarrow 25x + 50y = 1000$$

$$25(2y) + 50y = 1000$$

$$50y + 50y = 1000$$

$$100y = 1000$$

$$y = 10$$

$(20, 10)$

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#7)
$$\begin{cases} 3x + 2y = 0 \\ x - 5y = 17 \end{cases}$$

$x = 5y + 17$
 $x = 5(-3) + 17$
 $x = -15 + 17$
 $x = 2$

$3(5y + 17) + 2y = 0$
 $15y + 51 + 2y = 0$
 $17y + 51 = 0$
 $17y = -51$
 $y = -3$

$(2, -3)$

#8)
$$\begin{cases} 2x + 3y = 6 \\ x + 2y = 5 \end{cases}$$

$x = -2y + 5$
 $x = -2(4) + 5$
 $x = -8 + 5$
 $x = -3$

$2(-2y + 5) + 3y = 6$
 $-4y + 10 + 3y = 6$
 $-y + 10 = 6$
 $-y = -4$
 $y = 4$

$(-3, 4)$

#9)
$$\begin{cases} 3x - y = 2 \\ x + 2y = 3 \end{cases}$$

$x = -2y + 3$
 $x = -2(1) + 3$
 $x = -2 + 3$
 $x = 1$

$3(-2y + 3) - y = 2$
 $-6y + 9 - y = 2$
 $-7y + 9 = 2$
 $-7y = -7$
 $y = 1$

$(1, 1)$

#10)
$$\begin{cases} 4x + 5y = 6 \\ 6x - 7y = -20 \end{cases}$$

$5y = -4x + 6$
 $y = \frac{-4}{5}x + \frac{6}{5}$
 $y = \frac{-4}{5}(-1) + \frac{6}{5}$
 $y = \frac{4}{5} + \frac{6}{5}$
 $y = \frac{10}{5}$
 $y = 2$

$6x - 7\left(\frac{-4}{5}x + \frac{6}{5}\right) = -20$
 $6x + \frac{28}{5}x - \frac{42}{5} = -20$
 $30x + 28x - 42 = -100$
 $58x - 42 = -100$
 $58x = -58$
 $x = -1$

$(-1, 2)$

#11)
$$\begin{cases} y = 4x \\ x + y = 5 \end{cases}$$

$y = 4x$
 $y = 4(1)$
 $y = 4$

$x + (4x) = 5$
 $5x = 5$
 $x = 1$

$(1, 4)$

#12)
$$\begin{cases} x = -4y \\ 3x + 2y = 20 \end{cases}$$

$x = -4y$
 $x = -4(-2)$
 $x = 8$

$3(-4y) + 2y = 20$
 $-12y + 2y = 20$
 $-10y = 20$
 $y = -2$

$(8, -2)$

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#13)
$$\begin{cases} y = x - 1 \\ x + y = 3 \end{cases} \rightarrow \begin{cases} y = x - 1 \\ y = (x) - 1 \\ y = 1 \end{cases}$$

$$\begin{aligned} x + (x - 1) &= 3 \\ 2x - 1 &= 3 \\ 2x &= 4 \\ x &= 2 \end{aligned}$$

$(2, 1)$

#16)
$$\begin{cases} x - 5y = 10 \\ 2x - 10y = 20 \end{cases} \rightarrow x = 5y + 10$$

$$\begin{aligned} 2(5y + 10) - 10y &= 20 \\ 10y + 20 - 10y &= 20 \\ 20 &= 20 \end{aligned}$$

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Infinitely many Solution

#14)
$$\begin{cases} 3x - y = 4 \\ 2x - 3y = -9 \end{cases} \rightarrow \begin{cases} -y = 4 - 3x \\ y = -4 + 3x \\ y = -4 + 3(3) \\ y = -4 + 9 \\ y = 5 \end{cases}$$

$$\begin{aligned} 2x - 3(-4 + 3x) &= -9 \\ 2x + 12 - 9x &= -9 \\ 12 - 7x &= -9 \\ -7x &= -21 \\ x &= 3 \end{aligned}$$

$(3, 5)$

#17)
$$\begin{cases} x + 4y = 8 \\ 2x - 5y = 29 \end{cases} \rightarrow \begin{cases} x = -4y + 8 \\ x = -4(-1) + 8 \\ x = 4 + 8 \\ x = 12 \end{cases}$$

$$\begin{aligned} 2(-4y + 8) - 5y &= 29 \\ -8y + 16 - 5y &= 29 \\ -13y + 16 &= 29 \\ -13y &= 13 \\ y &= -1 \end{aligned}$$

$(12, -1)$

#15)
$$\begin{cases} x + 5y = 4 \\ 3x + 15y = -1 \end{cases} \rightarrow x = 4 - 5y$$

$$\begin{aligned} 3(4 - 5y) + 15y &= -1 \\ 12 - 15y + 15y &= -1 \\ 12 &= -1 \end{aligned}$$

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NO Solution

#18)
$$\begin{cases} 4x + y = 0 \\ x + 2y = -7 \end{cases} \rightarrow \begin{cases} y = -4x \\ y = -4(1) \\ y = -4 \end{cases}$$

$$\begin{aligned} x + 2(-4x) &= -7 \\ x - 8x &= -7 \\ -7x &= -7 \\ x &= 1 \end{aligned}$$

$(1, -4)$

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#19)

$$\begin{cases} 2x - 3y = -24 \\ x + 6y = 18 \end{cases}$$

$$\begin{aligned} \rightarrow x &= -6y + 18 \\ x &= -6(4) + 18 \\ x &= -24 + 18 \\ x &= -6 \end{aligned}$$

$$\begin{aligned} \rightarrow 2(-6y + 18) - 3y &= -24 \\ -12y + 36 - 3y &= -24 \\ -15y + 36 &= -24 \\ -15y &= -60 \\ y &= 4 \end{aligned}$$

$$(-6, 4)$$

#20)

$$\begin{cases} x + 14y = 84 \\ 2x - 7y = -7 \end{cases}$$

$$\begin{aligned} \rightarrow x &= 84 - 14y \\ x &= 84 - 14(5) \\ x &= 84 - 70 \\ x &= 14 \end{aligned}$$

$$\begin{aligned} 2(84 - 14y) - 7y &= -7 \\ 168 - 28y - 7y &= -7 \\ 168 - 35y &= -7 \\ -35y &= -175 \\ y &= 5 \end{aligned}$$

$$(14, 5)$$

Answers

- #1) (3, 0)
- #2) $(\frac{9}{2}, 2)$
- #3) (0, -7)
- #4) $(-\frac{1}{2}, 2.5)$
- #5) no solution
- #6) (20, 10)
- #7) (2, -3)
- #8) (-3, 4)
- #9) (1, 1)
- #10) (-1, 2)
- #11) (1, 4)
- #12) (8, -2)
- #13) (2, 1)
- #14) (3, 5)
- #15) no solution
- #16) infinitely many solutions.
- #17) (12, -1)
- #18) (1, -4)
- #19) (-6, 4)
- #20) (14, 5)