11-15-19

Solve the following systems of equatiosn by substitution. Be sure to check your solution set.

1. $y = 2x + 5$
   $3x + y = 10$

2. $5x + 4y = 32$
   $y = 9x - 33$

Agenda:
Solving systems through word problems

1. $y = 2x + 5$
   $3x + y = 10$

$3x + 2x + 5 = 10$
$5x + 5 = 10$
$-5 \quad -5$
$\frac{5x}{5} = \frac{5}{5}$
$x = 1$

$y = 2(1) + 5$
$y = 2 + 5$
$y = 7$
$(1, 7)$

Check:
$7 = 2(1) + 5$
$7 = 2 + 5$
$7 = 7$ ✓

$3(1) + 7 = 10$
$3 + 7 = 10$
$10 = 10$ ✓

2. $5x + 4y = 32$
$y = 9x - 33$

$5x + 4(9x - 33) = 32$

$5x + 36x - 132 = 32$

$41x - 132 = 32$

$+132 \quad +132$

$\frac{41x}{41} = \frac{164}{41}$

$x = 4$

$y = 9(4) - 33$

$y = 36 - 33$

$y = 3$

$(4, 3)$

check:

$5(4) + 4(3) = 32$

$20 + 12 = 32$

$32 = 32$ ✓

$3 = 9(4) - 33$

$3 = 36 - 33$

$3 = 3$ ✓

$y = 8x - 9$
$5x + 3y = 31$ (2, 7)

$x = 4y - 4$
$2x - 7y = -5$ (8, 3)

At the Apple Pan, three steakburgers and two orders of fries cost $18. Two steakburgers and three orders of fries cost $15.75. What is the cost for one steakburger? One order of fries?

x = steakburger y = fries

$3(3x+2y=18) \rightarrow 9x+6y=54$

$-2(2x+3y=15.75) \rightarrow -4x-6y=-31.5$

$5x=22.5$

$\frac{5x}{5}=\frac{22.5}{5}$

$x=4.5$

check: $2(4.5)+3(2.25)=15.75$

$9+6.75=15.75$

$15.75=15.75$ ✓

$3(4.5)+2y=18$

$13.5+2y=18$

$-13.5 \quad -13.5$

$2y=4.5$

$\frac{2y}{2}=\frac{4.5}{2}$

$y=2.25$

The cost of one steakburger is $4.50 and one order of fries is $2.25.

Or...

At the Apple Pan, three steakburgers and two orders of fries cost $18. Two steakburgers and three orders of fries cost $15.75. What is the cost for one steakburger? One order of fries?

s: steakburgers f: fries

$2(3s+2f=18) \rightarrow 6s+4f=36$

$-3(2s+3f=15.75) \rightarrow -6s-9f=-47.25$

$-5f=-11.25$

$\frac{-5f}{-5}=\frac{-11.25}{-5}$

$f=2.25$

check:

$2(4.5)+3(2.25)=15.75$

$9+6.75=15.75$

$15.75=15.75$ ✓

$3s+2(2.25)=18$

$3s+4.5=18$

$-4.5 \quad -4.5$

$3s=13.5$

$\frac{3s}{3}=\frac{13.5}{3}$

$s=4.5$

The cost for one steakburger is $4.50 and one order of fries is $2.25.

Substitution...

Find two numbers such that the sum of the first (x) and two times the second (y) is 19 and the sum of the second and three times the first is 32.

$x + 2y = 19$

$y + 3x = 32$

$-3x \quad -3x$

$\rightarrow y = -3x + 32$

$x + 2(-3x + 32) = 19$

$x - 6x + 64 = 19$

$-5x + 64 = 19$

$-64 \quad -64$

$-5x = -45$

$\frac{-5x}{-5} = \frac{-45}{-5}$

$x = 9$

$9 + 2y = 19$

$-9 \quad -9$

$2y = 10$

$\frac{2y}{2} = \frac{10}{2}$

$y = 5$

The first value (x) is 9, and the second value (y) is 5.

Or Elimination...

Find two numbers such that the sum of the first (x) and two times the second (y) is 19 and the sum of the second and three times the first is 32.

$-3(x + 2y = 19) \rightarrow -3x - 6y = -57$

$3x + y = 32 \rightarrow +\ 3x + y = 32$

$-5y = -25$

$\frac{-5y}{-5} = \frac{-25}{-5}$

$y = 5$

Check:

$3(9) + 5 = 32$

$27 + 5 = 32$

$32 = 32$ ✓

$x + 2(5) = 19$

$x + 10 = 19$

$-10 \quad -10$

$x = 9$

The first value (x) is 9 and the second value (y) is 5.