6.2 SOLVING LINEAR SYSTEMS BY SUBSTITUTION

Solve the linear system using substitution.

1. $y = 4$
   $3x - y = -9$

$3x - 4 = -9$
$+4 \quad +4$
$\frac{3x}{3} = \frac{-5}{3}$
$x = -\frac{5}{3}$
$\left(-\frac{5}{3}, 4\right)$

2. $x = -5$
   $-2x + 7y = 2$

$-2(-5) + 7y = 2$
$10 + 7y = 2$
$-10 \quad -10$
$\frac{7y}{7} = \frac{-8}{7}$
$y = -\frac{8}{7}$
$\left(-5, -\frac{8}{7}\right)$

Solve the linear system using substitution.

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

$2x + 3 = 5x$
$-2x \quad -2x$
$\frac{3}{3} = \frac{3x}{3}$
$1 = x$
$y = 5(1)$
$y = 5$
$(1, 5)$

4. $y = -8 + 4x$
   $y = 2x - 6$

$-8 + 4x = 2x - 6$
$-2x \quad -2x$
$-8 + 2x = -6$
$+8 \quad +8$
$\frac{2x}{2} = \frac{2}{2}$
$x = 1$
$y = 2(1) - 6$
$y = 2 - 6$
$y = -4$
$(1, -4)$

This method is BEST to use
when one of the variables
in either equation
has a coefficient of 1 or –1 .

Solve the linear system using substitution.

5. $y = $
$2x + y = -2$

$2x + x + 1 = -2$

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

$y = -1 + 1$
$y = 0$

$(-1, 0)$

6. $y = -3x + 5$
$2x - y = 10$

$2x - (-3x + 5) = 10$
$2x + 3x - 5 = 10$
$5x - 5 = 10$
$+5 \quad +5$
$\frac{5x}{5} = \frac{15}{5}$
$x = 3$

$y = -3(3) + 5$
$y = -9 + 5$
$y = -4$

$(3, -4)$

7. $x = 2y$
$2x + 6y = 15$

$2(2y) + 6y = 15$
$4y + 6y = 15$
$\frac{10y}{10} = \frac{15}{10}$
$y = 1.5$

$x = 2(1.5)$
$x = 3$

$(3, 1.5)$

If an equation is not already solved for a variable, you will need to do that first!

Pick the variable with a coefficient of 1 or -1.

8. $2x + 2y = 3$

$x - 4y = -1$

$+4y \quad +4y$

$x = 4y - 1$

$x = 4(\frac{1}{2}) - 1$

$x = 2 - 1$

$x = 1$

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

Which variable should we solve for?

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

$8y - 2 + 2y = 3$

$10y - 2 = 3$

$+2 \quad +2$

$\frac{10y}{10} = \frac{5}{10}$

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

9. $3x + y = 3$

$7x + 2y = 1$

Which variable should we solve for?

$7x + 2(-3x + 3) = 1$

$7x + -6x + 6 = 1$

$x + 6 = 1$

$-6 \quad -6$

$x = -5$

$3x + y = 3$

$-3x \quad -3x$

$y = -3x + 3$

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

$y = 15 + 3$

$y = 18$

$(-5, 18)$

10. $11x - 7y = -14$

$-x + 2y = 4$

$-2y \quad -2y$

$\frac{-x}{-1} = \frac{-2y+4}{-1} \quad -1$

$x = 2y - 4$

$x = 2(2) - 4$

$x = 4 - 4$

$x = 0$

Which variable should we solve for?

$11(2y-4) - 7y = -14$

$22y - 44 - 7y = -14$

$15y - 44 = -14$

$+44 \quad +44$

$\frac{15y}{15} = \frac{30}{15}$

$y = 2$

$(0, 2)$

11. $x + y = 16$

$2y = -2x + 2$

Which variable should we solve for?

Solve for x.

$x + y = 16$

$-y \quad -y$

$x = -y + 16$

$2y = -2(-y+16) + 2$

$2y = 2y - 32 + 2$

$-2y \quad -2y$

$0 = -32 + 2$

$0 \neq -30$

no solution

Solve for y.

$x + y = 16$

$-x \quad -x$

$y = -x + 16$

$2(-x+16) = -2x + 2$

$-2x + 32 = -2x + 2$

$+2x \quad +2x$

$32 \neq 2$

no solution

12. The length of a rectangle is 3 cm more than 3 times its width. If the perimeter of the rectangle is 30 cm, what are its dimensions? both length & width

$P=2l+2w$

$l = 3w+3$

$l=3(3)+3$

$l=9+3$

$l=12$

3cm by 12cm

$P=2l+2w$

$30=2(3w+3)+2w$

$30=6w+6+2w$

$30=8w+6$

$-6 \quad -6$

$\frac{24}{8}=\frac{8w}{8}$

$3=w$

13. The school is selling tickets for a fundraising event. The school sold 35 tickets for \$86 on the first day of the sale. Student tickets (x) cost \$2 each and non-student tickets (y) cost \$3 each. Find the number of each kind of ticket on the first day.

19 student tickets

16 non-student tickets

$x+y=35$

$-y \quad -y$

$x=-y+35$

$x=-16+35$

$x=19$

$2x+3y=86$

$2(-y+35)+3y=86$

$-2y+70+3y=86$

$y+70=86$

$-70 \quad -70$

$y=16$