Date: _____

Name: _____

Practise: Solving Systems by Substitution

1. Solve each linear system by substitution.

   a) $y = 4x + 14$ ① $y = -3x - 7$ ②

   Step 1: Substitute the expression for y from ① into ②.

   (handwritten: $+3x$) $4x + 14$ *(handwritten $+3x - 14$)* $= -3x - 7$ *(handwritten -14)*

   Step 2: Solve for x by rearranging to get the variable terms on one side of the equation and the number terms on the other.

   (handwritten:) $4x + 3x \quad = \quad -7 - 14$

   $\dfrac{7x}{7} = \dfrac{-21}{7}$

   $x = -3$

   Step 3: Substitute the value for x into one of the original equations. Then, solve for y.

   Using ①: $y = 4(\,-3\,) + 14$

   $y = -12 + 14$

   $y = 2$

   (handwritten:) SS POI $(-3, 2)$

   Step 4: Check by substituting into the other equation.

   $y = -3x - 7$ ②

   L.S. =   R.S. =

              R.S. =

              R.S. =   Does L.S. = R.S.? _____

(handwritten check table:)

LS	RS
y	$-3x - 7$
2	$-3(-3) - 7$
	$9 - 7$
	2

Hint

The substitution method starts with finding an expression for one of the variables.

$y = $ _____

Step 4: Check by substituting into the other equation.

$y = -3x - 7$ ②

L.S. =   R.S. =

             R.S. =

             R.S. =   Does L.S. = R.S.? _____

Therefore, the solution to the linear system is (,   ).

b) $y = -5x + 12$ ① $+5x$ $y = x + 4$ ② $+5x$

Step 1: $-5x + 12 = x + 4$

Step 2: -4 $12 = 6x + 4$ -4 $x = \dfrac{8}{6} = \dfrac{4}{3}$ $\boxed{x = \dfrac{4}{3}}$

$\dfrac{8}{6} = \dfrac{6x}{6}$

POI $\left(\dfrac{4}{3}, \dfrac{16}{3}\right)$

Step 3: $y = \left(\dfrac{4}{3}\right) + \left(\dfrac{4}{3}\right)$

$y = \dfrac{4}{3} + \dfrac{12}{3}$

$\boxed{y = \dfrac{16}{3}}$

Step 4:   LS   RS

$y = \dfrac{16}{3}$ $-5x + 12$

      $-5\left(\dfrac{4}{3}\right) + 12$

      $-\dfrac{20}{3} + 12$

      $-\dfrac{20}{3} + \dfrac{36}{3} = \dfrac{16}{3}$

Therefore, the solution to the linear system is ($\dfrac{4}{3}$,   ).

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Section 5.3

Solve this linear system by substitution.

$4x + y = 6$ ① $3x - 2y = 10$ ②

Step 1: Use one equation to find an expression for y, then substitute into the other equation.

Rewrite ① in the form $y = mx + b$: $y = $ ___ $-4x + 6$

Substitute this expression into ②: $3x - 2($ ___ $-4x+6$ $) = 10$

Step 2: Solve for x.

POI $(2, -2)$

$$3x - 2(-4x + 6) = 10$$
$$3x + 8x - 12 = 10$$
$$11x - 12 + 12 = 10 + 12$$
$$\frac{11x}{11} = \frac{22}{11} \qquad \boxed{x = 2}$$

Step 3: Substitute $x = $ ___ into either of the original equations, then solve for y.

Using ①: $4(2) + y = 6$
$$8 + y = 6 - 8$$
$$-8 \quad -8$$
$$y = 6$$
$$\boxed{y = -2}$$

Step 4: Check by substituting into the other equation.

$3x - 2y = 10$ ②

L.S. $= 3($ ___ $) - 2($ ___ $)$ R.S. $= 10$

L.S.	R.S.
$3x - 2y$	10
$3(2) - 2(-2)$
$6 + 4$
10

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Solve each system by substitution.

8) $x - 4y = -7$
$-4x - 8y = -20$

Handwritten work:

① $x - 4y = -7$
$-4y = -x - 7$
$\dfrac{-4y}{-4} = \dfrac{-x}{-4} - \dfrac{7}{-4}$
$y = -\dfrac{1}{4}x + \dfrac{7}{4}$

② $-4x - 8\left(\dfrac{1}{4}x + \dfrac{7}{4}\right) = -20$
$-4x - \dfrac{8}{4\times 1}x - \dfrac{56}{4} = -20$
$-\dfrac{16x}{4} - \dfrac{8x}{4} - \dfrac{56}{4} = -20$
$-4x - 2x - 14 = -20$
$-6x - 14 = -20$
$\quad\quad +14 \quad +14$
$\dfrac{-6x}{-6} = \dfrac{-6}{-6}$
$x = 1$

③ $x - 4y = -7$
$1 - 4y = -7 \quad -1$
$-4y = -8$
$\dfrac{-4y}{-4} = \dfrac{-8}{-4}$
$y = 2$

LS   RS

$-4x - 8y \mid -20$
$-4(1) - 8(2)$
$-4 - 16$
$-20 \mid$
POT

$(1, 2)$