4.4 Algebraic Solution of Systems of Equations

1) C and D are complete solutions.

3)

a) We need to substitute 1 for *y* back into the original equation and solve for *x*.

b) Substitute 1 for *y* in either equation and solve for *x*:

$3x + 2(1) = 3$		$x + 4(1) = \frac{13}{3}$
$3x + 2 = 3$	OR	$x + 4 = \frac{13}{3}$
$3x = 1$		$x = \frac{13}{3} - \frac{12}{3}$
$x = \frac{1}{3}$		$x = \frac{1}{3}$

Solution: $(\frac{1}{3}, 1)$

5)

$4x + 15(\frac{1}{3}x + \frac{2}{5}) = -12$

$4x + 5x + 6 = -12$

$9x + 6 = -12$

$9x = -18$

$x = -2$

$y = \frac{1}{3}\ (-2) + \frac{2}{5} = -\frac{2}{3} + \frac{2}{5} = -\frac{10}{15} + \frac{6}{15} = -\frac{4}{15}$

Solution: $(-2, -\frac{4}{15})$

7)

a) The error occurs in the adding of the two equations. The *y* terms do not add to 0. They would add to ^-6y.

b) Both sides of the second equation should be multiplied by $^-3$ to give $-9x + 3y = -42$.

$4x - 3y = 22$

$\underline{-9x + 3y = -42}$

$-5x = -20$

$x = 4$

$(3)(4) - y = 14$

$12 - y = 14$

$y + 14 = 12$

$y = -2$

Solution: $(4, ^-2)$

9) Multiply both sides of the 2^{nd} equation by $^-2$ to get $-2x + 6y = -2$

$2x + 5y = 24$

$$\underline{-2x + 6y = -2}$$
$$11y = 22$$
$$y = 2$$

$$2x + (5)(2) = 24$$
$$2x + 10 = 24$$
$$2x = 14$$
$$x = 7$$

Solution: (7, 2)

11) Elimination is easier. Multiply one of the equations by ⁻1 and add the equations. This causes the *y*-terms to add to zero and the resulting equation may be solved for *x*.

a) Add both equations to get

$$5x = 0$$
$$x = 0$$

$$(7)(0) - 3y = 4$$
$$-3y = 4$$
$$y = -\tfrac{4}{3}$$

Solution: $(0, -\tfrac{4}{3})$

13) $-x = y + 3$ ç Substitution will be an easier method

$x = -(y + 3)$ ç Find an expression for *x* in the 2nd equation

$-(y + 3) + 2y = 4$ ç Substitute this expression for *x* in the 1st equation

$$-y - 3 + 2y = 4$$
$$y - 3 = 4$$
$$y = 7$$

$$-x = y + 3$$
$$-x = (7) + 3$$
$$-x = 10$$
$$x = -10$$

Solution: (⁻10, 7)

a) Verify solution in both equations:

First Equation	Second Equation
$(-10) + (2)(7) = 4$	$-(-10) = (7) + 3$
$-10 + 14 = 4$	$10 = 7 + 3$
$4 = 4$ è True	$10 = 10$ è True

15) Use substitution because you already have one equation in slope-intercept form:

$y = 2x - 1$
$4x - 2(2x - 1) = -5$
$4x - 4x + 2 = -5$
$2 = -5$ è Impossible because $2 \neq -5$.

There is no solution to this system of equations (*inconsistent system*). The graphs of these equations form parallel lines.

Skill and Review

17)

a)	$m = 0$	ç Horizontal lines have zero slope.
b)	$m = 2$	ç Equation is in slope-intercept form.
c)	m is undefined	ç Vertical lines have undefined slope.
d)	$m = -1$	ç Equation is in slope-intercept form.

19)

a) $RUN = 2 - (-4) = 2 + 4 = 6$
$RISE = (-1) - 3 = -4$

$DISTANCE = \sqrt{(RUN)^2 + (RISE)^2}$
$DISTANCE = \sqrt{(6)^2 + (-4)^2}$
$DISTANCE = \sqrt{36 + 16}$
$DISTANCE = \sqrt{52}$

b) 52 is a little more than $49 = 7^2$, so $\sqrt{52}$ is a little more than $\sqrt{49} = 7$. A good estimate is $\sqrt{52} \approx 7.2$.

