3.2 Part 2 The Elimination Method

The purpose of the elimination method (also called the linear combination method) is to eliminate one of the variables.

How can we eliminate variables?

opposite coefficients

7y & -7y 4x & -4x

1. $4x - 2y = 2$
$+ \; 3x + 2y = 12$
$\frac{7x}{7} = \frac{14}{7}$
$x = 2$

$3(2) + 2y = 12$
$6 + 2y = 12$
$-6 \quad -6$
$\frac{2y}{2} = \frac{6}{2}$
$y = 3$
$(2, 3)$

2. $5x + 2y = -4$
$+ \; -5x + 3y = 19$
$\frac{5y}{5} = \frac{15}{5}$
$y = 3$

$5x + 2(3) = -4$
$5x + 6 = -4$
$-6 \quad -6$
$\frac{5x}{5} = \frac{-10}{5}$
$x = -2$
$(-2, 3)$

3. $2(2x - 3y) = (4) \cdot 2$

$-4x + 5y = -8$

$4x - 6y = 8$

$+ \quad -4x + 5y = -8$

$-1y = 0$

$\frac{-1y}{-1} = \frac{0}{-1}$

$y = 0$

$4x - 6(0) = 8$

$\frac{4x}{4} = \frac{8}{4}$

$x = 2$

$(2, 0)$

4. $9x - 3y = 15$

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

$9x - 3y = 15$

$-9x + 3y = -15$

$0 = 0$

true

↓

infinitely many solutions

5. $2(-3x + 2y) = (7)2$

$6x - 4y = 14$

$-6x + 4y = 14$

$6x - 4y = 14$

$0 \neq 28$

false

↓

no solution

6. $4(3x + 5y) = (6)4$

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

$12x + 20y = 24$

$-12x + 6y = 15$

$\frac{26y}{26} = \frac{39}{26}$

$y = 1.5$

$(-.5, 1.5)$

$12x + 20(1.5) = 24$

$12x + 30 = 24$

$-30 \quad -30$

$\frac{12x}{12} = \frac{-6}{12}$

$x = -.5$

7. $3x + 2y = 8$

$2y = 12 - 5x$

$+5x \quad +5x$

$5x + 2y = 12$

$-1(3x + 2y) = (8) \cdot -1$

$5x + 2y = 12$

$-3x - 2y = -8$

$\frac{2x}{2} = \frac{4}{2}$

$x = 2$

$-3(2) - 2y = -8$

$-6 - 2y = -8$

$+6 \quad +6$

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

$y = 1$

$(2, 1)$

8. $7y = -4x + 9$

$+4x \quad +4x$

$3x = 3y + 18$

$-3y \quad -3y$

$3(4x + 7y) = (-9) \cdot 3$

$7(3x - 3y) = (18) \cdot 7$

$12x + 21y = -27$

$21x - 21y = 126$

$\frac{33x}{33} = \frac{99}{33}$

$x = 3$

$4(3) + 7y = -9$

$12 + 7y = -9$

$-12 \quad -12$

$\frac{7y}{7} = \frac{-21}{7}$

$y = -3$

$(3, -3)$

x = # of shirts y = # of skirts

9. Elise purchases shirts for $28 and skirts for $15. If she spends a total of $131 and buys a total of 7 items, how many of each did she purchase? Define the variables, write a system of equations and solve.

money $28x + 15y = 131$

items $-28 \cdot (x + y) = (7) \cdot -28$

$28x + 15y = 131$

$-28x - 28y = -196$

$\frac{-13y}{-13} = \frac{-65}{-13}$

$y = 5$

$x + 5 = 7$

$-5 \quad -5$

$x = 2$

2 shirts
5 skirts

x = oranges y = grapefruits

10. A fruit company plans to make 13.25 lb gift boxes of oranges and grapefruits. Each box is to have a retail value of $21. Each orange weighs 0.50 lb and has a retail value of $0.75, while each grapefruit weighs 0.75 lb and has a retail value of $1.25. How many oranges and grapefruits should be included in each box? Define the variables, write a system of equations and solve.

$ $2(0.75x + 1.25y) = (21.00)\cdot 2$

lb $3(0.50x + 0.75y) = (13.25)\cdot 3$

$1.50x + 2.50y = 42.00$

$-1.50x + 2.25y = -39.75$

$\frac{.25y}{.25} = \frac{2.25}{.25}$

$y = 9$

$0.50x + 0.75(9) = 13.25$

$0.50x + 6.75 = 13.25$

$-6.75 \quad -6.75$

$\frac{0.50x}{.50} = \frac{6.50}{.50}$

$x = 13$

13 oranges
9 grapefruits