

Pre-Calculus CP 1 – Section 7.3 Notes  
Solving Systems of Equations with THREE unknowns

Name: KEY

Ex 1: Super EASY!

$$2x - y + 5z = 24$$

$$y + 2z = 4$$

$$z = 4$$

$$\rightarrow y + 2(4) = 4 \Rightarrow y = -4$$

$$2x - (-4) + 5(4) = 24$$

$$2x + 24 = 24$$

$$x = 0$$

Ex 2: Moderately more difficult

a)  $x + y + z = 6$

$$2x - y + z = 3$$

$$3x - z = 0$$

$$z = 3x$$

$$x + y + 3x = 6$$

$$4x + y = 6$$

$$2x - y + 3x = 3$$

$$5x - y = 3$$

$$4x + y = 6$$

$$9x = 9$$

$$x = 1$$

$$z = 3$$

$$y = 6 - 4(1) = 2$$

b)  $6y + 4z = -12$

$$5x + 3y = 4$$

$$3y - 4z = 4$$

$$6y + 4z = -12$$

$$3y - 4z = 4$$

$$9y = -8$$

$$y = -\frac{8}{9}$$

$$5x + 3\left(-\frac{8}{9}\right) = 4$$

$$5x - \frac{8}{3} = \frac{12}{3}$$

$$5x = \frac{20}{3}$$

$$x = \frac{20}{15} = \frac{4}{3}$$

$$2\left(-\frac{8}{9}\right) + 4z = -12$$

$$-\frac{16}{9} + 4z = -\frac{36}{3}$$

$$4z = -\frac{20}{3}$$

$$z = -\frac{20}{12}$$

$$z = -\frac{5}{3}$$

Ex. 3: Difficult- lots of steps!

a)  $2x+4y+z=1$   
 $x-2y-3z=2$   
 $x+y-z=-1$

$$x = z - y - 1$$

$$x = 3 - (-3) - 1 = 5$$

$$z - y - 1 - 2y - 3z = 2$$

$$* -3y - 2z = 3$$

$$* 2(z - y - 1) + 4y + z = 1$$

$$2z - 2y - 2 + 4y + z = 1$$

$$* 2y + 3z = 3$$

$$* \times 2 \quad -6y - 4z = 6$$

$$* \times 3 \quad 6y + 9z = 9$$

$$5z = 15$$

$$z = 3$$

$$2y + 9 = 3$$

$$2y = -6 \quad y = -3$$

$$(5, -3, 3)$$

b)  $x+2y-7z=-4$

$2x+y+z=13$

$3x+9y-36z=-33$

$$x = 7z - 2y - 4$$

$$2(7z - 2y - 4) + y + z = 13$$

$$14z - 4y - 8 + y + z = 13$$

$$\textcircled{A} \quad 15z - 3y = 21$$

$$3(7z - 2y - 4) + 9y - 36z = -33$$

$$21z - 6y - 12 + 9y - 36z = -33$$

$$\textcircled{B} \quad -15z + 3y = -21$$

$$\rightarrow 15z - 3y = 21$$

$$0 = 0$$

infinite solutions!

## Application

A small corporation borrowed \$775,000 to expand its clothing line. Some of the money was borrowed at 8%, some at 9%, and some at 10%. How much was borrowed at each rate if the annual interest owed was \$67,500 and the amount borrowed at 8% was four times the amount borrowed at 10%?

$$.08x + .09y + .1z = 67,500$$

$$x + y + z = 775,000$$

$$x = 4z$$

$$.08(4z) + .09y + .1z = 67,500$$

$$.32z + .09y + .1z = 67,500$$

$$.42z + .09y = 67,500$$

$$\textcircled{A} \quad 42z + 9y = 675,000$$

$$\textcircled{B} \quad 5z + y = 775,000$$

$$y = 775,000 - 5z$$

$$42z + 9(775,000 - 5z) = 675,000$$

$$42z + 6,975,000 - 45z = 675,000$$

$$225,000 = 3z$$

$$\$75,000 = z \quad \textcircled{10\%}$$

$$\$300,000 \quad \textcircled{8\%} \quad : x$$

$$\$400,000 \quad \textcircled{9\%} \quad : y$$