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

Name: _____KEY_____

Ex 1: Super EASY!

$2x - y + 5z = 24$
$\quad y + 2z = 4$
$\qquad z = 4$

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

$2x - (-4) + 5(4) = 24$
$2x + 24 = 24$
$2x = 0$
$x = 0$

$(0, -4, 4)$
$\quad\uparrow\quad\uparrow\quad\uparrow$
$\quad x, y, z$

Ex. 2: Moderately more difficult

a) $x + y + z = 6$
$\quad 2x - y + z = 3$
$\quad 3x - \quad z = 0 \rightarrow z = 3x$

$x + y + 3x = 6$
$4x + y = 6$ ✶

$2x - y + 3x = 3$
$5x - y = 3$ ✶
$+(4x + y = 6)$ ✶
$\overline{\qquad 9x = 9}$
$x = 1$
$z = 3(1) = 3$
$4(1) + y = 6$
$y = 2$
$(1, 2, 3)$

b) $6y + 4z = -12$
$\quad 5x + 3y \quad = 4$
$\quad\quad 3y - 4z = 4$

$6y + 4z = -12$
$+(3y - 4z = 4)$
$\overline{\quad 9y = -8}$
$y = -8/9$

$5x + 3\left(\frac{-8}{9_3}\right) = 4$
$5x - 8/3 = 12/3$
$5x = 20/3$
$x = \frac{20}{15} = \frac{4}{3}$

$6\left(\frac{-8}{9_3}\right) + 4z = -12$
$\frac{-16}{3} + 4z = \frac{-36}{3}$
$4z = \frac{-20}{3}$
$z = \frac{-20}{12} = \frac{-5}{3}$

$\left(\frac{4}{3}, -\frac{8}{9}, \frac{-5}{3}\right)$

Ex. 3: Difficult- lots of steps!

a) $2x+4y+z=1$ $x=z-y-1$ $\times 3$ $6y+9z=9$

$x-2y-3z=2$

$x+y-z=-1$ $\times 2$ $+(-6y-4z=6)$

$2(z-y-1)+4y+z=1$ $5z=15$

$2z-2y-2+4y+z=1$ $z=3$

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

$z-y-1-2y-3z=2$ $2y=-6$

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

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

$(5,-3,3)$

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

$2x+y+z=13$

$3x+9y-36z=-33$ $\rightarrow$ $x+3y-12z=-11$

$\rightarrow -(x+2y-7z=-4)$

$y-5z=-7$

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

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

$-3y+15z=21$

$-y+5z=7$

$+(y-5z=-7)$

$0=0$ 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%?

$$0.08x + 0.09y + 0.10z = 67,500$$
$$x + y + z = 775,000$$
$$x = 4z$$

$$0.08(4z) + 0.09y + 0.10z = 67,500$$
$$0.32z + 0.09y + 0.10z = 67,500$$
$$0.09y + 0.42z = 67,500$$

(A) $\quad 9y + 42z = 6,750,000$

(B) $\begin{cases} 4z + y + z = 775,000 \\ y + 5z = 775,000 \\ y = 775,000 - 5z \end{cases}$

$$9(775,000 - 5z) + 42z = 6,750,000$$
$$6,975,000 - 45z + 42z = 6,750,000$$
$$225,000 = 3z$$

$$z = \$75,000 \ @ \ 10\%$$
$$x = \$300,000 \ @ \ 8\%$$
$$y = \$400,000 \ @ \ 9\%$$

Homework: p. 527, #1a, 5, 13, 15, 43