Enrichment
Objective 3.02 and 4.03
Solving systems using matrices

You can use matrices to solve systems of equations.

Example:
2x + 6y = 80
4x + 5y = -1

Step 1: Make a coefficient matrix, variable matrix, and a constant matrix.

$$\overset{\begin{matrix} x & \;\; y \end{matrix}}{\begin{bmatrix} 2 & 6 \\ 4 & 5 \end{bmatrix}} \times \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 80 \\ -1 \end{bmatrix}$$

coefficient matrix	variable matrix	constant matrix
A	X	B

You can use the inverse property of matrices to solve for X: $A^{-1}B = X$

Step 2: Put A (coefficient matrix) and B (constant matrix) in your calculator.

Step 3: Enter in the following to get your answer for x and y.

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[A]-1[B]
            [[-29]
             [23  ]]
```

x = -29 y = 23 or (-29, 23)

You try:

1. x + 8y = 16
   9x + 12y = 66

2. 29x + 7y = 1012
   8x – 25y = 737

Answer: 1. (5.6, 1.3) 2. (39, -17)

Solving Systems with three variables using matrices

$x - y + z = -1$
$x + y + 3z = -3$
$2x - y + 2z = 0$

Step 1: Set up a coefficient, variable, and constant matrix

$$\begin{bmatrix} 1 & -1 & 1 \\ 1 & 1 & 3 \\ 2 & -1 & 2 \end{bmatrix} \times \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -1 \\ -3 \\ 0 \end{bmatrix}$$

A X B

Step 2: Put A (coefficient matrix) and B (constant matrix) in your calculator.

Step 3: Enter $A^{-1}B$ to solve for x, y, z.

Answer: x = 4 y = 2 z = -3 or (4, 2, -3)

*If there is a variable missing in the equation ex: x + y = 2, the coefficient for z is 0**

You try:

1. $2x - y + z = -2$
   $x + 3y - z = 10$
   $x \quad + 2z = -8$

2. $13 = 3x - y$
   $4y - 3x + 2z = -3$
   $z = 2x - 4y$

*Hint: put all equations in standard form first!

Answers: 1. (2, 1, -5) 2. (5, 2, 2)