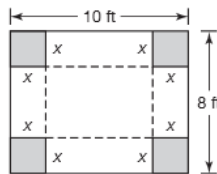


**LESSON 3.1** Assignment

Name \_\_\_\_\_ Date \_\_\_\_\_

**Planting the Seeds**  
**Exploring Cubic Functions**

- Cynthia is an engineer at a manufacturing plant. Her boss asks her to use rectangular metal sheets to build storage bins with the greatest possible volume. Each rectangular sheet is 8 feet by 10 feet. Cynthia's sketch shows the squares to be removed from the corners of each sheet. The dashed lines indicate where the metal sheets will be folded before they are welded to form the prism-shaped storage bins without tops.



3

- Complete the table.

Side Length, $x$ , of Removed Squares (ft)	Height of Bin (ft)	Width of Bin (ft)	Length of Bin (ft)	Volume of Bin (ft <sup>3</sup> )
0				
1				
2				
3				
4				

- Write a function  $V(x)$  to represent the volume of a bin in terms of the side length,  $x$ , of the removed squares. Explain your reasoning.

**LESSON 3.1** Assignment

page 2

- c. Represent the function  $V(x)$  on a graphing calculator. Determine the domain and range of the function. Determine the domain and range of the function as they relate to the problem situation. Explain your reasoning.

- d. Determine the maximum volume of a bin. What are the dimensions of a bin with the maximum volume?

**3**

- e. Determine any relative maximums or relative minimums of  $V(x)$ . Then, determine the intervals over which the function is increasing and decreasing.

- f. Determine the  $x$ - and  $y$ -intercepts of the graph of  $V(x)$ . What do they represent in this problem situation?

- g. Cynthia's boss asks her to make several bins with volumes of exactly 40 cubic feet. Determine the bin dimensions that will work.

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**LESSON 3.1** Assignment

page 3

Name \_\_\_\_\_ Date \_\_\_\_\_

2. Write a cubic function with zeros of  $-4$ ,  $2$ , and  $3$ . Write the function in the form  $f(x) = ax^3 + bx^2 + cx + d$ . Verify graphically that the function has the correct zeros.

**3**

3. Consider the given functions.

- $f(x) = x + 2$
- $g(x) = x^2 - 3.5x + 2.5$
- $h(x) = f(x) \cdot g(x) = (x + 2)(x^2 - 3.5x + 2.5)$

- a. Determine the zeros of  $f(x)$ ,  $g(x)$ , and  $h(x)$ .

- b. How are the zeros of  $h(x)$  related to the zeros of  $f(x)$  and  $g(x)$ . Explain why this is true.

- c. Write a function  $m(x)$  that has the same zeros as  $h(x)$  plus an additional zero of  $5$ . Verify your answer graphically.