

Polynomial Word Problems

1. You are designing a marble planter for a city park. You want the length of the planter to be six times the height and the width to be three times the height. The sides should be one foot thick. Because the planter will be on the sidewalk, it does not need a bottom.

- a. Draw a picture of the planter with its dimensions:      b. Write a function  $V(h)$  that expresses the volume  $V$  of the planter in terms of its height  $h$ . What type of function is this?

- c. What should the outer dimensions of the planter be if it is to hold 4 cubic feet of dirt?

2. When you stand on a diving board,  $y$ , the amount the board bends below its rest position is a cubic function of  $x$ , the distance from the built-in end to where you're standing on the board. Suppose that you make the following measurements:

X: Distance from built-in end (feet)	Y: Amount the board bends (thousandths of an inch)
0	0
1	116
2	448
3	972

- a. Use your calculator to derive the equation expressing the amount the board bends from horizontal ( $y$ ) in terms of distance from the built-in end of the board ( $x$ ).

- b. Suppose you are standing at the end of a 10-foot long diving board. How far is the end of the board below the horizontal?

Draw a picture of the diving board with labels:

Your solution:

3. Suppose that you have a summer job with a company that designs pollution control equipment. Your part of the project is to estimate the monthly cost of electricity to operate the smokestack scrubbers for a new cement plant. From the Power Company, you find that the monthly bills for various amounts of electricity would be as shown in the table below.

Kilowatt Hours (kwh)	Dollars
1,000,000	\$20,000
2,000,000	\$29,000
3,000,000	\$34,000
4,000,000	\$41,000

Since you need the cost of any amount of power, from 1,000,000 through 4,000,000 kwh, you need an equation expressing cost in terms of kwh. You decide a cubic function is reasonable.

- a. Let  $D$  = the number of thousands of dollars per month, and let  $k$  = the number of millions of kwh per month. Write the particular equation expressing  $D$  in terms of  $k$ .
- b. Predict the cost of 1.5 million kwh. Show your work or explain what you did on the calculator.
- c. Your boss wants to know how much electricity could be used without exceeding \$35,000 per month. Show your work or explain what you did on the calculator to find the answer.

4. A rectangular corral is to be built by stringing an electric fence with  $y$  feet parallel to the side of the river and  $x$  feet for each of the two sides perpendicular to the river. The total length of the fence is to be 900 feet.

- a. Draw a picture that represents the problem. Label the relevant parts.
- b. Write an equation expressing  $y$  in terms of  $x$ . What kind of function is this?
- c. Now write a function  $A(x)$  that expresses the area  $A$  of the enclosed space in terms of side length  $x$ . What kind of function is this?
- d. Evaluate  $A(100)$ .
- e. What side length  $x$  will maximize the area of the enclosed space? What is the maximum area?