Name: **Date:**   **Period:**

8.1.1 How can I describe the graph?

Sketching Graphs of Polynomial Functions

In previous courses and chapters, you learned how to graph many types of functions, including lines and parabolas. Today, you will work with your team to apply your graphing knowledge to graph more complicated polynomial functions. Just as quadratic polynomial functions can be written in standard or factored form, other polynomial functions can be written in standard or factored form. For example, $y = x^4 - 4x^3 - 3x^2 + 10x + 8$ is in standard form, but it can be written in factored form as $y = (x + 1)^2 (x–2)(x–4)$

Warm-up

Please calculate the x-intercepts and y-intercepts of $y = x^2 - 6x - 40$

Area model and x-box method

8-1. The Mathamericaland Carnival Company has decided to build a new roller coaster to use at this year's county fair. The new coaster will have a very special feature: part of the ride will be underground. The designers will use polynomial functions to describe different pieces of the track. Part of the design is shown at right. Your task is to guess a possible equation to represent the track and test it on your graphing calculator. To help get an idea of what to try, start by checking the graphs of the equations given below. Think about how the graphs are the same and how they are different.

1. $y = x(x-2)$
2. $y = x(x-2)^2$
3. $y = x(x-2)(x-3)$
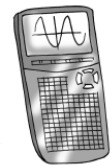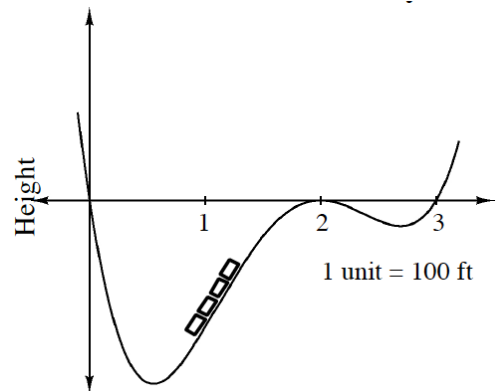
Your Task: Use the information you found by graphing the above equations to help you make guesses about the equation that would produce the graph of the roller coaster. Once you have found a graph that has a shape close to this one, try zooming in or changing the viewing window on your graphing calculator to see the details better. Keep track of what you tried and the equations you find that fit most accurately.

8-2. POLYNOMIAL FUNCTION INVESTIGATION

In this investigation, you will determine which information in the equation of a polynomial function can help you sketch its graph.

Your Task: With your team, write a thorough description, including examples and justifications, of the relationship between a polynomial function and its graph. To accomplish this task, first divide up the functions listed below so that each team member is responsible for two or three of them. Make a complete graph of each of your functions. Whenever possible, start by making a sketch without using your graphing calculator. Then, as a team, share your observations including your responses to the Discussion Points that follow. Then, choose two or three functions that can be used to represent all of your results. You can choose them from the list below, or you can create new ones as a team.

Create a presentation for your class. Be sure you include complete graphs and descriptions.

$P_1(x) = (x-2)(x+5)^2$	$P_2(x) = 2(x-2)(x+2)(x-3)$
$P_3(x) = x^4 - 21x^2 + 20x$	$P_4(x) = (x+3)^2(x+1)(x-1)(x-5)$
$P_5(x) = -0.1x(x+4)^3$	$P_6(x) = x^4 - 9x^2$
$P_7(x) = 0.2x(x+1)(x-3)(x+4)$	$P_8(x) = x^4 - 4x^3 - 3x^2 + 10x + 8$

Polynomial Function:

- Graph of the function:

- X-intercepts:
- Y-intercepts:
- Numbers of turns:
- When x gets smaller, what happens to the graph?

- When x gets larger, what happens to the graph?

- What is the highest power of the function?

- What is the leading coefficient?

Whole Class Discussion

01.   Which functions have similar graphs? Do they have the same highest power? How about their leading coefficients?

02.   For those similar graphs, what do you notice about their end behaviors? (Like when x gets smaller, y gets smaller or bigger)