5 CHAPTER REVIEW

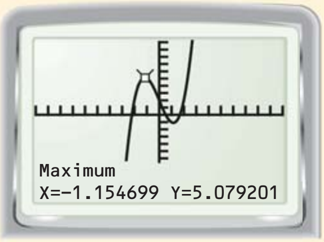
5.8 Analyze Graphs of Polynomial Functions

pp. 387–392

EXAMPLE

Graph the function $f(x) = x^3 - 4x + 2$. Identify the x-intercepts and the points where the local maximums and local minimums occur.

Use a graphing calculator to graph the function.



Notice that the graph has three x-intercepts and two turning points. You can use the graphing calculator's *zero*, *maximum*, and *minimum* features to approximate the coordinates of the points.

The x-intercepts of the graph are about -2.21, 0.54, and 1.68. The function has a local maximum at $(-1.15, 5.08)$ and a local minimum at $(1.15, -1.08)$.

EXERCISES

EXAMPLE 2 on p. 388 for Exs. 39–40

Use a graphing calculator to graph the function. Identify the x-intercepts and the points where the local maximums and local minimums occur.

39. $f(x) = -2x^3 - 3x^2 - 1$

40. $f(x) = x^4 + 3x^3 - x^2 - 8x + 2$

5.9 Write Polynomial Functions and Models

pp. 393–399

EXAMPLE

Use finite differences and a system of equations to find a polynomial function that fits the data.

x	1	2	3	4	5	6
$f(x)$	1	9	23	43	69	101

$f(1)$ $f(2)$ $f(3)$ $f(4)$ $f(5)$ $f(6)$
1 9 23 43 69 101 — **Write function values for equally-spaced x-values.**
8 14 20 26 32 — **First-order differences**
6 6 6 6 — **Second-order differences**

Because the second-order differences are constant, the data can be represented by a function of the form $f(x) = ax^2 + bx + c$. By substituting the first 3 data points into the function, you obtain a system of 3 linear equations in 3 variables.

$a(1)^2 + b(1) + c = 1 \rightarrow a + b + c = 1$

$a(2)^2 + b(2) + c = 9 \rightarrow 4a + 2b + c = 9$

$a(3)^2 + b(3) + c = 23 \rightarrow 9a + 3b + c = 23$

Solve the system. The solution is $(3, -1, -1)$, so $f(x) = 3x^2 - x - 1$.

EXERCISES

EXAMPLE 3 on p. 395 for Ex. 41

41. Use finite differences to find a polynomial function that fits the data.

x	1	2	3	4	5	6
$f(x)$	-6	-21	-40	-57	-66	-61