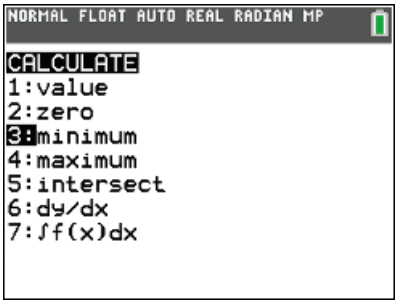

FIGURE 12

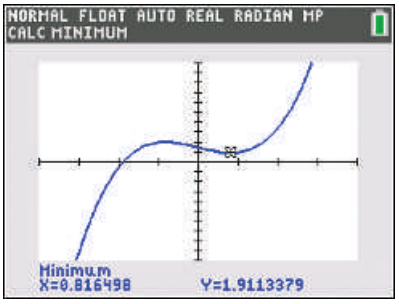

FIGURE 13

Finding a Minimum or Maximum Value of a Function

For the function in Example 4, note that there is an interesting dip downward between $x = 0$ and $x = 2$. Let us determine the minimum y-value in this interval. With the function $x^3 - 2x + 3$ typed into Y1, and with a window that includes the interval from $x = 0$ to $x = 2$, press graph and then 2nd trace (for the CALCULATE menu), and select 3:minimum. You can do this by using the down arrow and pressing enter, or just by pressing 3.

You will be prompted for a left bound; press Ø and enter. You will then be prompted for a right bound; press 2 and enter. Finally, you will be prompted for a guess; press 1 and enter. The result

```
Minimum
X=Ø.816498  Y=1.9113379
```

will appear at the bottom of the screen. Thus, the minimum value of the function, $y = 1.9113379$, occurs at $x = 0.816498$. Similarly, we can find a maximum value of a function by selecting 4:maximum from the CALCULATE menu.

1.4 EXERCISES

PRACTICE

In Exercises 1–8, express each function (using parentheses, ^, ÷, etc.) in a form suitable for typing into a graphing calculator.

1. $f(x) = 1 + 3x + \sqrt{x}$

2. $f(x) = 3x - 2 + \sqrt[3]{x}$

3. $f(x) = \dfrac{3x}{\sqrt{x-1}}$

4. $f(x) = \dfrac{1+\sqrt{x}}{2-3x}$

5. $f(x) = \dfrac{(-3x+16)^4}{3x+6}$

6. $f(x) = \sqrt{2+5x+\sqrt{x}}$

7. $f(x) = \left(2x^{\frac{2}{3}} + 3x^{\frac{5}{3}}\right)^5$

8. $f(x) = \left(9x^{\frac{1}{5}} + 2x^{\frac{3}{5}}\right)^{10}$

TECHNOLOGY

In Exercises 9–22, graph the given function in the standard window [–10, 10] by [–10, 10]. Explain in a sentence why the standard window is not suitable for the graph of the function. Then find a more appropriate window, which reveals the significant parts of the graph.

9. $f(x) = \dfrac{3x-25}{\sqrt{x^2+5}}$

10. $f(x) = (3x+4)^2(5x-25)^2$

11. $f(x) = (6x+30)^2(3x-15)^2$

12. $f(x) = (40+3x)\sqrt{16-x}$

13. $f(x) = 35 + 17x - x^2 - x^3$

14. $f(x) = 210 - 80x + x^3$

15. $f(x) = 35 + 56x - 14x^2$

16. $f(x) = 25 + 50x - 10x^2$

17. $f(x) = \sqrt[3]{x^3 - x^2 - x - 50}$

18. $f(x) = \sqrt[3]{x^4 - 3x^2 - 3x - 30}$

19. $f(x) = \left(10 + 2x - 25x^2\right)^{\frac{1}{3}}$

20. $f(x) = \left(30 - 11x + x^2\right)^{\frac{1}{3}}$

21. $f(x) = \left(12 - 6x - x^2\right)^{\frac{4}{3}}$

22. $f(x) = \left(x^3 - x - 100\right)^{\frac{1}{3}}$

Graph each function in the window shown in Exercises 23–30. Make a table of *x*- and *y*-values for the values $x = -2, -1, 0$, and 2. Then find all the zeros of the function in the given *x*-interval.

23. $f(x) = 10 + 5x - 6x^3$; [–4, 4] by [–20, 20]

24. $f(x) = \dfrac{5^x + 3}{25x^2 + 3x + 3} - 2$; [–4, 4] by [–5, 5]

25. $f(x) = \dfrac{x\sqrt[3]{x-5}}{1+x}$; [–2, 8] by [–5, 5]

26. $f(x) = \dfrac{\left(2 + 3x - x^2\right)(14 - x)}{\sqrt{x^2 + 20}}$; [–5, 20] by [–5, 5]

27. $s(x) = (x-3)\left(-16x^2 + 32x - 70\right)$; [–3, 8] by [–200, 400]

28. $s(x) = \left(x^2 + 3\right)\left(3 - 40x + x^2\right)^{\frac{1}{2}}$; [–5, 5] by [–200, 200]

29. $u(x) = \left(3 - 12x + 18x^{\frac{3}{2}}\right)^{\frac{1}{2}}$; [–5, 5] by [–8, 12]

30. $u(x) = \dfrac{(32 - 11x)^2 (x+3)}{\sqrt{12 + x}}$; [–5, 9] by [–1200, 1600]

For Exercises 31–40, graph the function in a suitable window and find the smallest *y*-value possible, or the smallest in the *x*-interval specified.

31. $f(x) = x^2 - 104x + 2724$

32. $f(x) = \dfrac{-1 - x^2 - 3x^3}{5^x}$

33. $f(x) = x^3 - 17x + 5;\ -3 \le x \le 5$

34. $f(x) = \dfrac{\sqrt[3]{x} - 150}{5 + x^2}$

35. $f(x) = x^{1.5} - 8x - 15$

36. $f(x) = x^{1.8} - x - 100$

37. $f(x) = 2^x - 50x$

38. $f(x) = (1.5)^{x+1} - (x+1)^5;\ -5 \le x \le 5$

39. $f(x) = 17^x - x^{17};\ -2 \le x \le 2$

40. $f(x) = (-x)\left(3^{-x}\right)$