

suggests that the singular point occurs at exactly $x = 1$. In fact, we can calculate

$$f'(x) = \frac{2}{3(x-1)^{1/3}} - x$$

From this formula we see clearly that $f'(x)$ is defined everywhere except at x

Endpoints The only endpoint in the domain is $x = -2$, which gives a relative minimum

Thus, we have found the following approximate extrema for f :

A relative (endpoint) minimum at $(-2, 0.08)$


An absolute (stationary) maximum at $(-0.57, 1.19)$

A relative (singular) minimum at $(1, -0.5)$

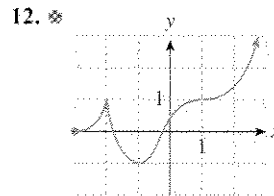
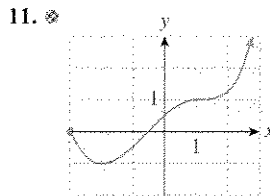
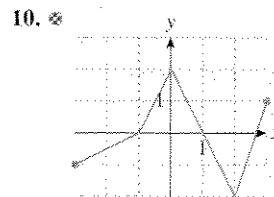
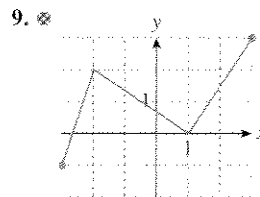
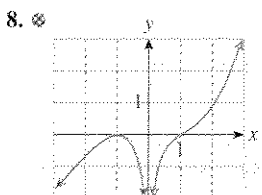
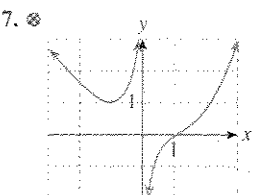
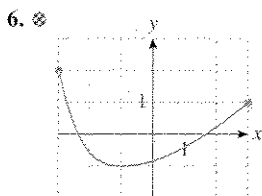
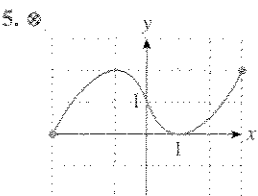
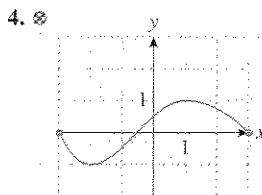
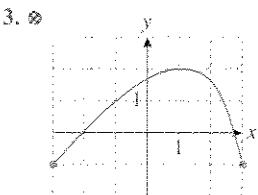
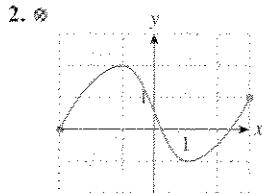
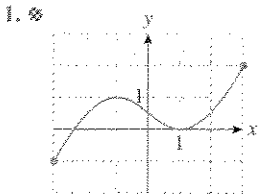
A relative (stationary) maximum at $(1.18, -0.38)$

5.1 EXERCISES

✳ denotes basic skills exercises

 Ex indicates exercises that should be solved using technology

In Exercises 1–12, locate and classify all extrema in each graph. (By classifying the extrema, we mean listing whether each extremum is a relative or absolute maximum or minimum.) Also, locate any stationary points or singular points that are not relative extrema.



Find the exact location of all the relative and absolute extrema of each function in Exercises 13–44.

13. ✳ $f(x) = x^2 - 4x + 1$ with domain $[0, 3]$ *hint* [see Example 1]

14. ✳ $f(x) = 2x^2 - 2x + 3$ with domain $[0, 3]$

15. ✳ $g(x) = x^3 - 12x$ with domain $[-4, 4]$

16. ✳ $g(x) = 2x^3 - 6x + 3$ with domain $[-2, 2]$

17. ✳ $f(t) = t^3 + t$ with domain $[-2, 2]$

18. ✳ $f(t) = -2t^3 - 3t$ with domain $[-1, 1]$

19. ✳ $h(t) = 2t^3 + 3t^2$ with domain $[-2, +\infty)$ *hint* [see Example 2]

20. ✳ $h(t) = t^3 - 3t^2$ with domain $[-1, +\infty)$

21. ✳ $f(x) = x^4 - 4x^3$ with domain $[-1, +\infty)$

22. ✳ $f(x) = 3x^4 - 2x^3$ with domain $[-1, +\infty)$

23. ✳ $g(t) = \frac{1}{4}t^4 - \frac{2}{3}t^3 + \frac{1}{2}t^2$ with domain $(-\infty, +\infty)$

24. ✳ $g(t) = 3t^4 - 16t^3 + 24t^2 + 1$ with domain $(-\infty, +\infty)$

25. ✳ $h(x) = (x-1)^{2/3}$ with domain $[0, 2]$ *hint* [see Example 1]