5.2 Critical Points

Extreme Value Theorem:
  If a function f is continuous over the interval $[a, b]$, then f has at least one minimum value and at least one maximum value on $[a, b]$.
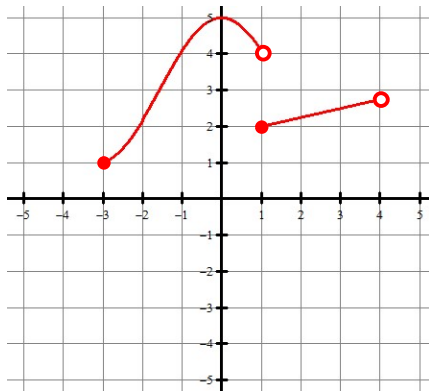
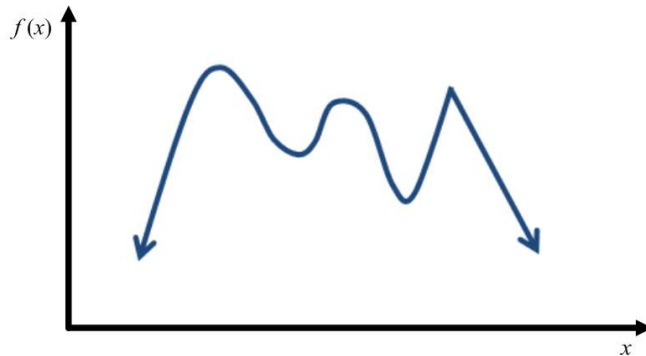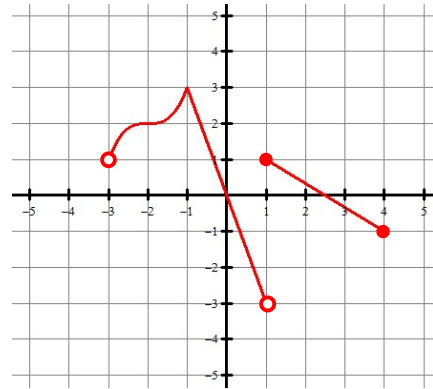**Global vs. Local Extrema**

or

Absolute vs. Relative Extrema
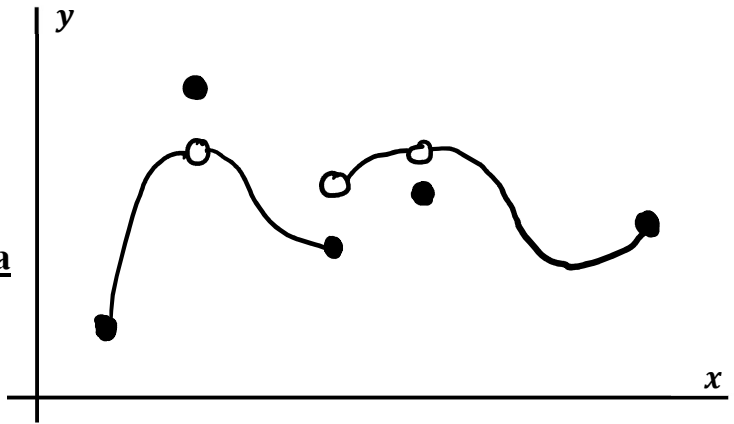
Find all extreme values. Identify the type and where they occur.

1.

2.

Critical Point:

How do you find a critical point?

      1.

      2.

Find all critical points

3. $f(x) = \frac{1}{3}x^3 - 9x + 24$
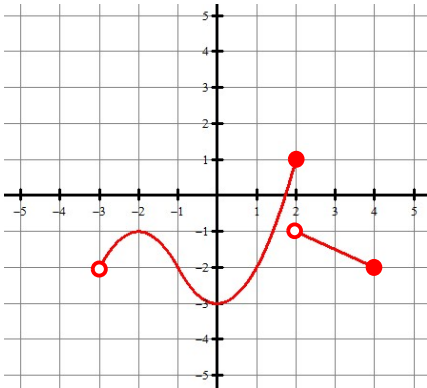
4. $g(x) = \frac{1}{\sqrt{4-x^2}}$
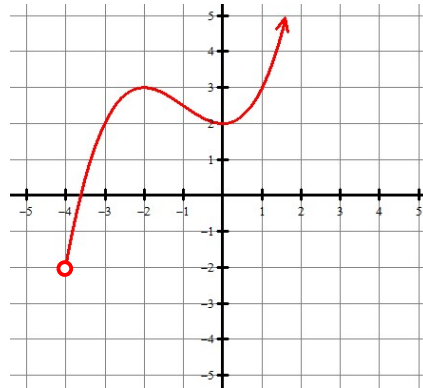
5.2 Critical Points

Calculus

Practice

Find all extreme values. Identify the type and where they occur. For example, an answer could be written as "absolute max of 3 at $x = 1$."
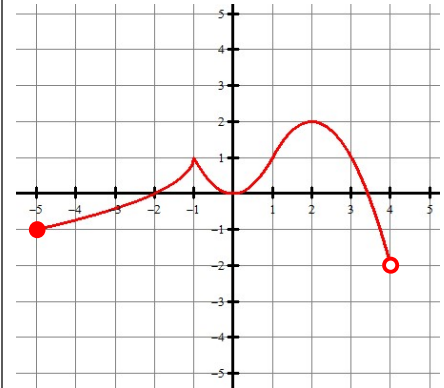
1.

2.

3.

Find the critical points.		
4. $f(x) = 4x^3 - 9x^2 - 12x + 3$	5. $g(t) = \frac{2}{t^2 - 4}$	6. $h(x) = \sqrt[3]{x - 2}$
7. $f(x) = (\ln x)^2$	8. $h(x) = 2\sin\left(\frac{x}{2}\right)$ where $-2\pi \le x \le 2\pi$	9. $g(x) = e^x - x$

5.2 Critical Points

Test Prep

10. **Calculator active problem.** The first derivative of the function f is given by $f'(x) = \frac{\sin^2 x}{x} - \frac{2}{9}$. How many critical values does f have on the open interval $(0, 10)$?

   A) One   (B) Two   (C) Three   (D) Four   (E) Six

11. If f is a continuous, decreasing function on $[0,10]$ with a critical point at $(4, 2)$, which of the following statements must be false?

    (A) $f(10)$ is an absolute minimum of f on $[0,10]$.

    (B) $f(4)$ is neither a relative maximum nor a relative minimum.

    (C) $f'(4)$ does not exist

    (D) $f'(4) = 0$

    (E) $f'(4) < 0$