

Calculus Section 3.6 A Summary of Curve Sketching

-Determine the important values to find and use while analyzing a graph and its derivatives.

Describe how the function $f(x)$ behaves from the graphs of $f(x)$, $f'(x)$, and $f''(x)$.

Graph of $f(x)$

Increasing/decreasing: Where the graph is going up/down

Relative max/min: The top of a hill or bottom of a valley

Critical points: Relative max/mins, sharp turns, vertical tangents

Concave up/down: Where the graph is cupped up/down

Point of inflection: Where the concavity changes

Graph of $f'(x)$

Increasing/decreasing: Where the graph is positive/negative

Relative max/min: Where the graph changes from positive to negative (or vice versa)

Critical points: Where the graph crosses the x-axis, or where the graph does not exist

Concave up/down: Where the graph is increasing/decreasing

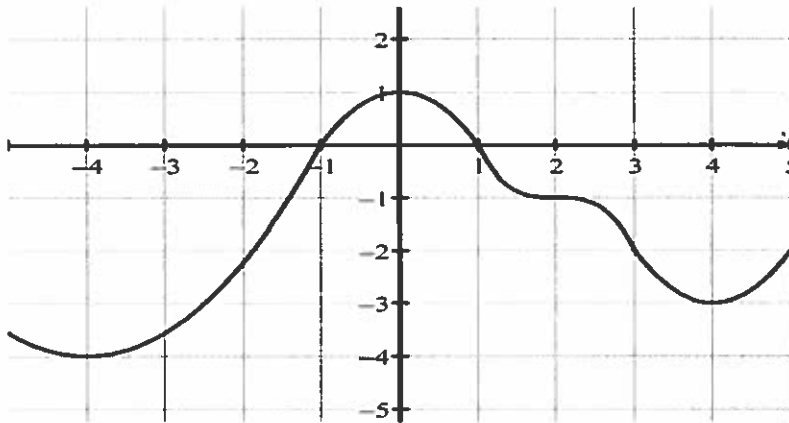
Point of inflection: The top of a hill or bottom of a valley (Rel max/min of $f'(x)$)

Graph of $f''(x)$

Concave up/down: Where the graph is positive/negative

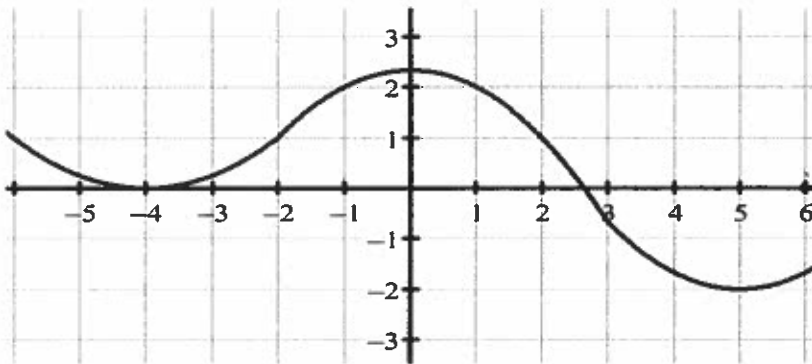
Point of inflection: Where the graph crosses the x-axis

The graph of a function $f(x)$ is given. For $f(x)$, what are the critical points, intervals of increasing/decreasing, what are its relative maximums/minimums, its points of inflection, and where is it concave up/down?



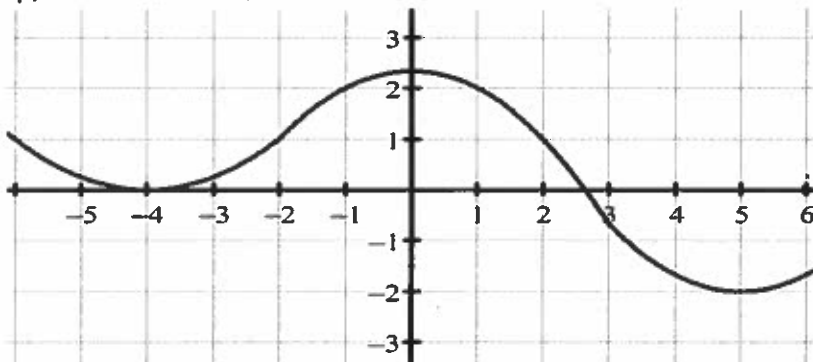
Critical points: $x = -4$ $x = 0$ $x = 2$ $x = 4$
 Increasing: $(-4, 0) \cup (4, \infty)$
 Decreasing: $(-\infty, -4) \cup (0, 4)$
 Rel. max: $x = 0$
 Rel. min: $x = -4$ $x = 2$
 Points of Inflection: $x = -1$ $x = 1$ $x = 2$ $x = 3$
 Concave up: $(-\infty, -1) \cup (1, 2) \cup (3, \infty)$
 Concave down: $(-1, 1) \cup (2, 3)$

The graph of a derivative function $g'(x)$ is given. For $g(x)$, what are the critical points, intervals of increasing/decreasing, what are its relative maximums/minimums, its points of inflection, and where is it concave up/down?



Critical points: $x = -4$ $x = 2.5$
 Increasing: $(-\infty, -4) \cup (4, 2.5)$
 Decreasing: $(2.5, \infty)$
 Rel. max: $x = 2.5$
 Rel. min: None
 Points of Inflection: $x = -2$ $x = 3$
 Concave up: $(-\infty, -2) \cup (3, \infty)$
 Concave down: $(-2, 3)$

The graph of the 2nd derivative $h''(x)$ is given. Identify points of inflection and where the graph is concave up/down for $h(x)$.



Points of Inflection: $x = 2.5$
 Concave up: $(-\infty, -4) \cup (-4, 2.5)$
 Concave down: $(2.5, \infty)$