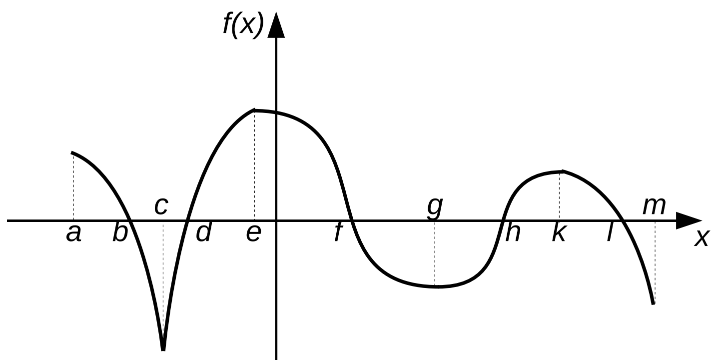
Chapter 5. **Applications of differentiation**

Section 5.1 **What does f' say about f?**

- If $f'(x) > 0$ on an interval, then f is increasing on that interval
- If $f'(x) < 0$ on an interval, then f is decreasing on that interval
- f has a **local maximum** at the point, where its derivative changes from positive to negative.
- f has a **local minimum** at the point, where its derivative changes from negative to positive.

Example 1. Given the graph of the function f.



(a.) What are the x-coordinate(s) of the points where $f'(x)$ does not exist?

(b.) Identify intervals on which $f(x)$ is increasing.

Is decreasing.

(c.) Identify the x coordinates of the points where $f(x)$ has a local maximum.

A local minimum.

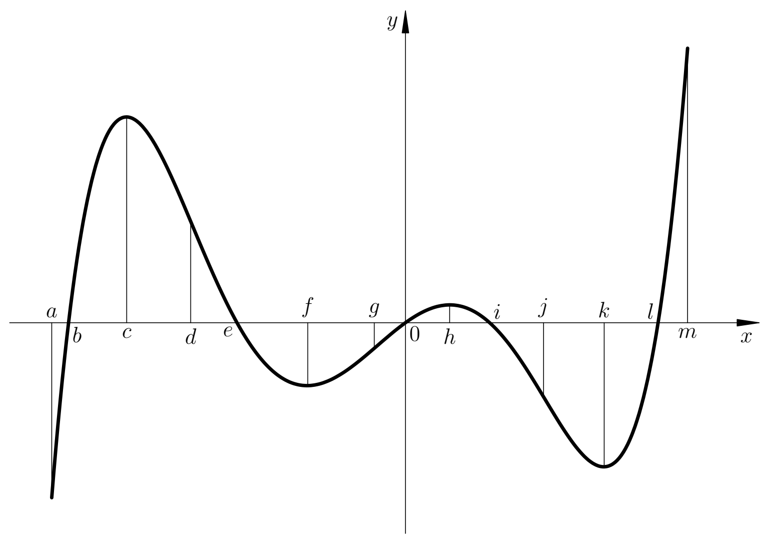
What does f'' say about f?

- If $f''(x) > 0$ on an interval, then f is **concave upward (CU)** on that interval
- If $f''(x) < 0$ on an interval, then f is **concave downward (CD)** on that interval

Definition. A point where curve changes its direction of concavity is called an **inflection point**

Use the following graph of the derivative, $f'(x)$, of the function $y = f(x)$ to answer questions 1-5:

Example 2. Given the graph of $f'(x)$.



(a.) Identify intervals on which f is increasing.

Is decreasing.

(b.) Identify the x coordinates of the points where f has a local maximum.

A local minimum.

(c.) Identify intervals on which f is concave upward.

Concave downward.

(d.) Find the x-coordinates of inflection points.