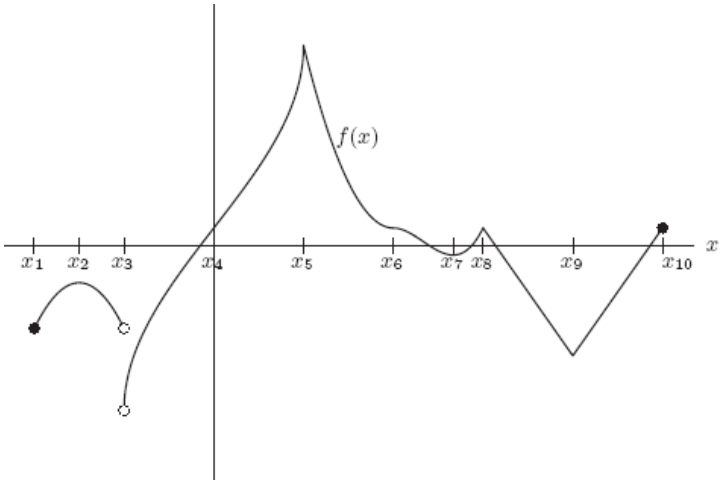
Critical Points, Local Maxima, and Local Minima

Local maximum?



What are the critical points of f?

What are the local minima of f?

What are the local maxima of f?

How do the above answers change if the upper hole at x_3 is filled in?

How do the above answers change if the lower hole at x_3 is filled in?

The table records the rate of change of air temperature, H, as a function of hours since midnight, t, during one morning.

t	6	7	8	9	10	11	12
dH / dt	1	2	0	-2	0	3	2

When was the temperature a local minimum?

Critical Points, Local Maxima, and Local Minima

Find all critical points, local minima, and local maxima of the following functions.

$f(x) = 4x^3 + 3x^2 - 36x - 5$

$g(x) = x - 2\ln(x^2 + 3)$

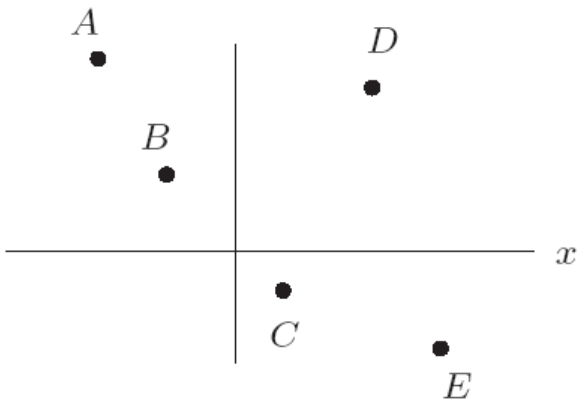
Critical Points, Local Maxima, and Local Minima

Find a differentiable function that has a local maximum at $(0,5)$, a local minimum at $(2,1)$, and no other local extrema.

Graph two continuous functions f and g, each of which has exactly five critical points, the points A-E in Figure 4.12, and which satisfy the following conditions:

(a) $f(x) \to \infty$ as $x \to -\infty$ and
$f(x) \to \infty$ as $x \to \infty$

(b) $g(x) \to -\infty$ as $x \to -\infty$ and
$g(x) \to 0$ as $x \to \infty$



Which of the following pieces of information from a daily weather report allow you to conclude with certainty that there was a local maximum of temperature at some time after 10:00 am and before 2:00 pm?

(a) Temperature 50° at 10:00 am and 50° and falling at 2:00 pm.

(b) Temperature 50° at 10:00 am and 40° at 2:00 pm.

(c) Temperature rising at 10:00 am and falling at 2:00 pm.

(d) Temperature 50° at 10:00 am and 2:00 pm, 60° at noon.

(e) Temperature 50° at 10:00 am and 60° at 2:00 pm.

Assume f has a derivative everywhere and just one critical point, at $x = 3$. In parts (a) – (d), you are given additional conditions. In each case, decide whether $x = 3$ is a local maximum, a local minimum, or neither. Sketch possible graphs for all four cases.

(a) $f'(1) = 3$ and $f'(5) = -1$

(b) $f(x) \to \infty$ as $x \to \infty$ and as $x \to -\infty$

(c) $f(1) = 1, f(2) = 2, f(4) = 4, f(5) = 5$

(d) $f'(2) = -1, f(3) = 1, f(x) \to 3$ as $x \to \infty$