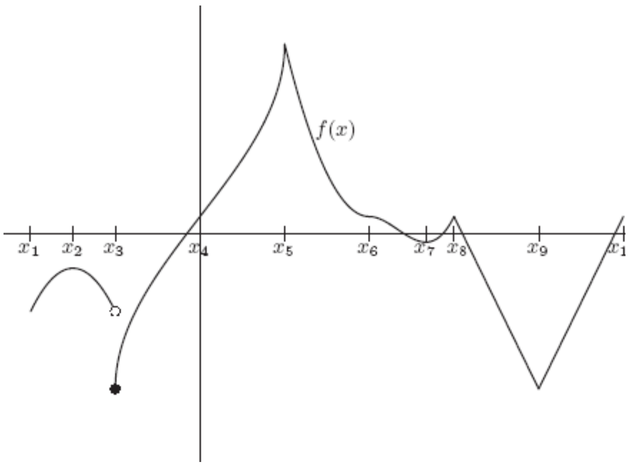
Global Optima and Inflection Points



Where is the global maximum of $f(x)$?

Where is a local maximum that is not a global maximum of $f(x)$?

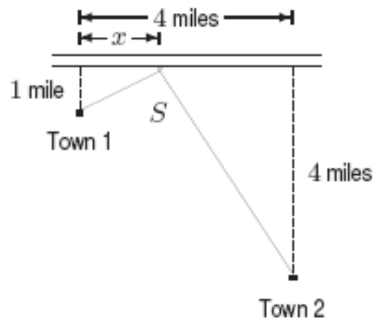
Where is the global minimum of $f(x)$?

Where is a local minimum that is not a global minimum of $f(x)$?

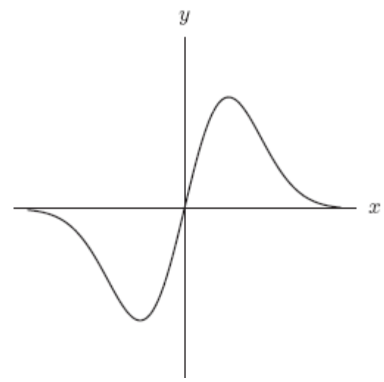
Find the global maximum and minimum for $f(x) = 3 + 5x - x^2$ on the interval $[1,5]$.

Find the global maximum and minimum for $f(x) = x - \ln(x)$ on the interval $(0,\infty)$.

On the same side of a straight river are two towns, and the townspeople want to build a pumping station, S. See the figure. The pumping station is to be at the river's edge with pipes extending straight to the two towns. Where should the pumping station be located so as to minimize the total length of the pipe?

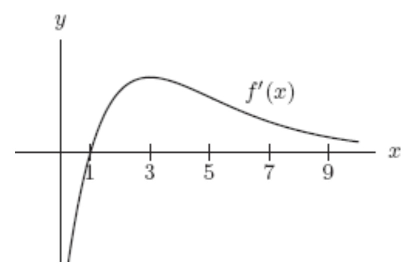


The function $y = f(x)$ is shown in the figure. How many critical points does this function have on the interval shown?



How many inflection points does this function have on the interval shown?

The graph of the derivative $y = f'(x)$ is shown in the figure. The function $f(x)$ has an inflection point at what number?



The derivative $f'(x)$ has an inflection point at what number?

The table records the rate of change of air temperature, H, as a function of time, t, as a warm front passes through one morning. What could be the rate at 11:00 if H has an inflection point at 10:00?.

t (hours after midnight)	8	9	10	11
dH/dt (°F/hour)	2	3	4	?

For the first three months of an exercise program, Joan's muscle mass increased, but at a slower and slower rate. Then there was an inflection point in her muscle mass, as a function of time. What happened after the first three months?