4.2 Critical Values and Local Extrema

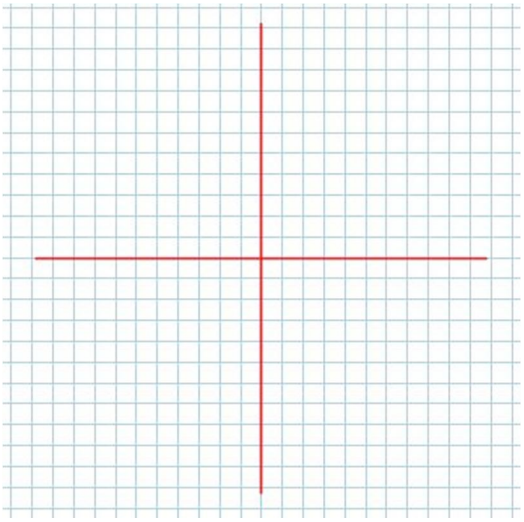
(Much of this is review)

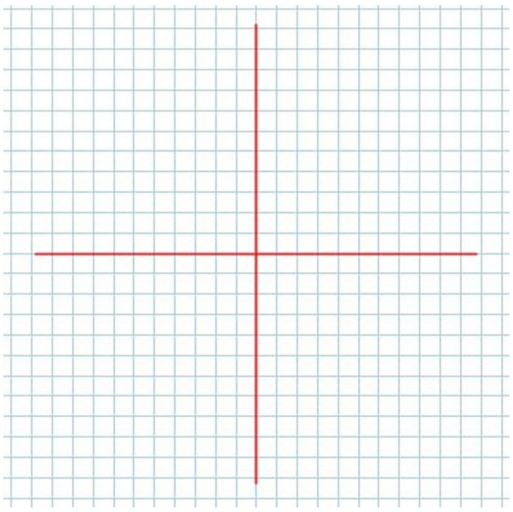
Recall: an **extremum** (an extreme value) is either a **maximum** or a **minimum**.

Definition 4.2.1

Given a differentiable function, $f(x)$, at any domain values $x = c$, where $f'(c) = 0$, then $f(x)$ **MAY** have **local extrema** at $x = c$.

Pictures





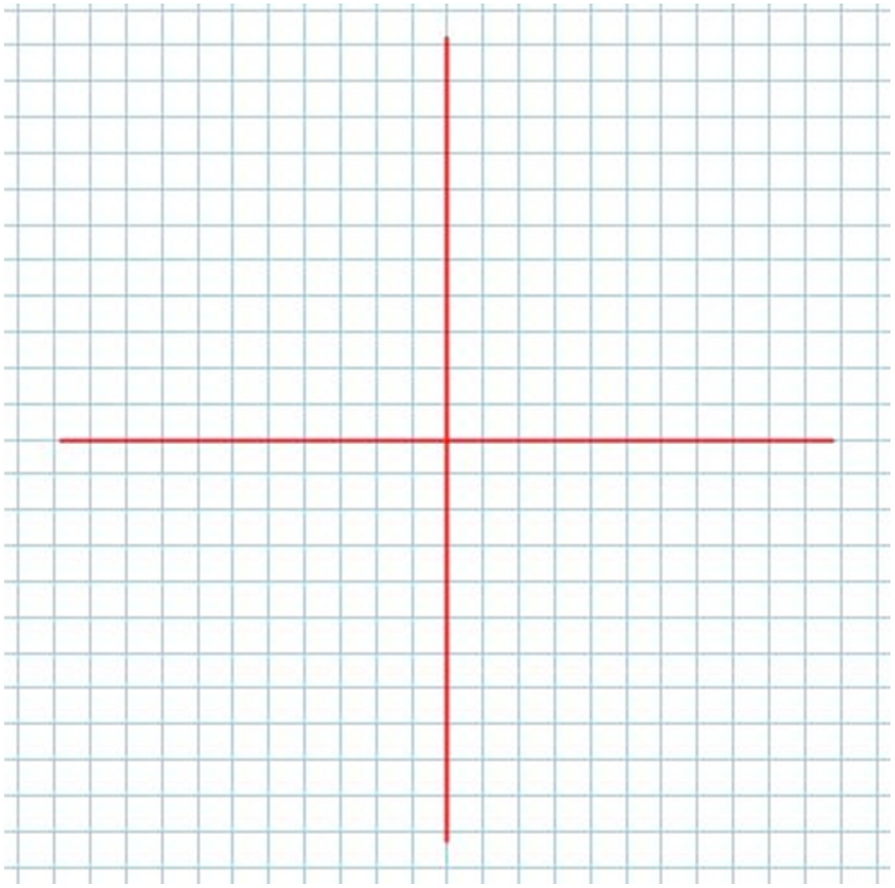
The First Derivative Test *(more formally than in 4.1)*

Given a differentiable function, $f(x)$, where $f'(c)=0$, and if:

1) $f'(c-h)>0$ **AND** $f'(c+h)<0$ (where *h* is some ***small*** positive number)
   then $x=c$ is where $f(x)$ has a local maximum.

2) $f'(c-h)<0$ **AND** $f(c+h)>0$ (where *h* is some ***small*** positive number)
   Then $x=c$ is where $f(x)$ has a local minimum.

Picture



Definition 4.2.2

Given a differentiable function, $f(x)$, we say $x=c$ is a critical value of $f(x)$ if either:

Example 4.2.1

Determine the critical values of $f(x)=\dfrac{x^2-4}{x-3}$, and determine if $f(x)$ has any local extrema.

Class/Homework for Section 4.2

Pg. 178 – 180 #1 – 5, 7cdef, 9, 10, 12 – 15