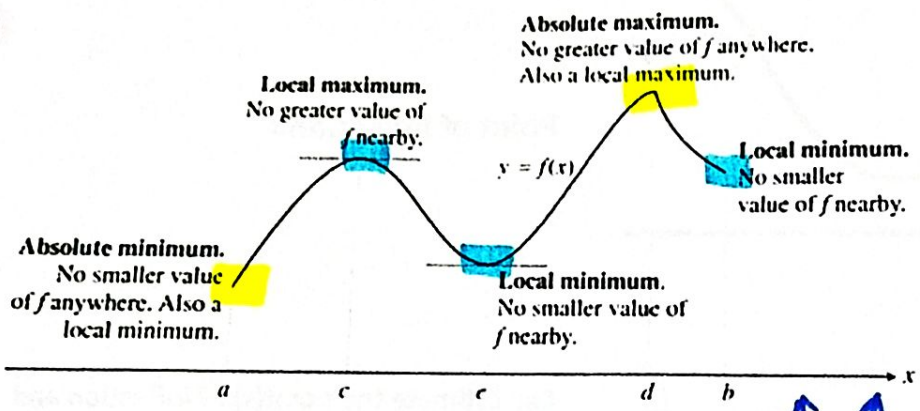
Polynomial Behavior and Critical Points

(Extrema, Intervals of Increase/Decrease, Points of Inflection & Concavity)

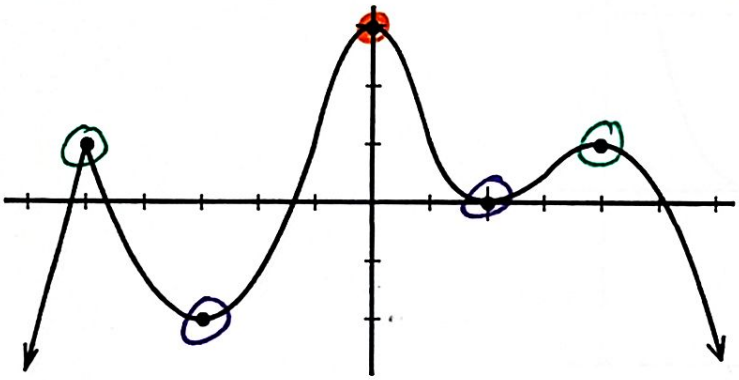


Extrema (plural of Extremum)= Largest and smallest y-values of a function

Local Minimum & Maximum= Lowest and highest points relative to a section

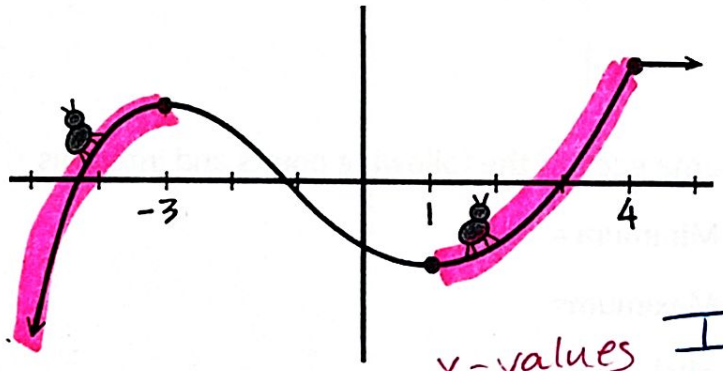
Absolute (Global) Minimum & Maximum = lowest and highest points of the entire Function.

local/relative minimum
local/relative maximum



Ex: Find the minimum and maximum points of the function.

Absolute maximum: (0, 3)
Absolute minimum: none
Local maximum: (-5, 1) & (4, 1)
Local minimum: (-3, -2) & (2, 0)



Intervals of Increase and Decrease

A function is increasing when ...

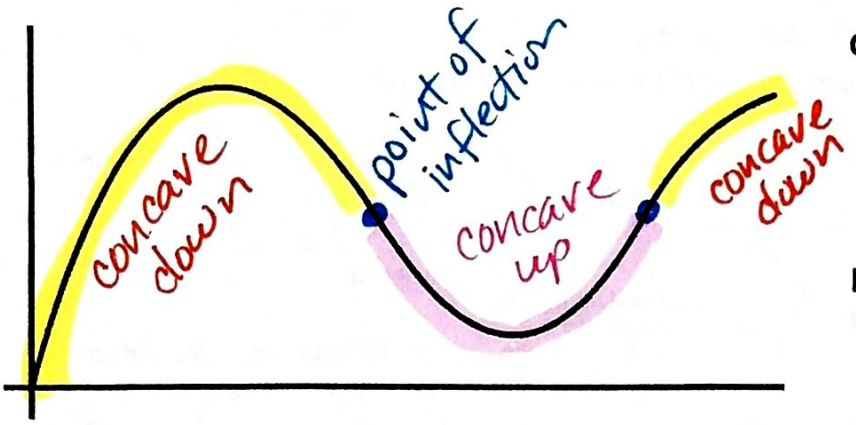
its y-values increase (go up) from left to right

x-values → Increasing from $(-\infty, -3)$ and $(1, 4)$

A function is decreasing when

the y-values decrease from left to right.

Decreasing from $(-3, 1)$

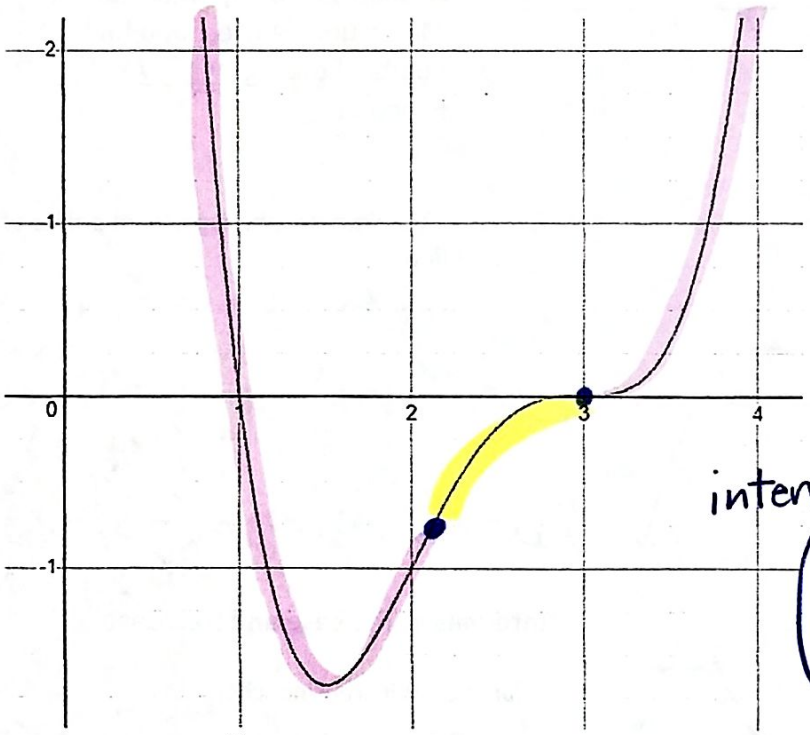


Concavity = describes the way a function curves

Point of Inflection=
coordinate where concavity switches

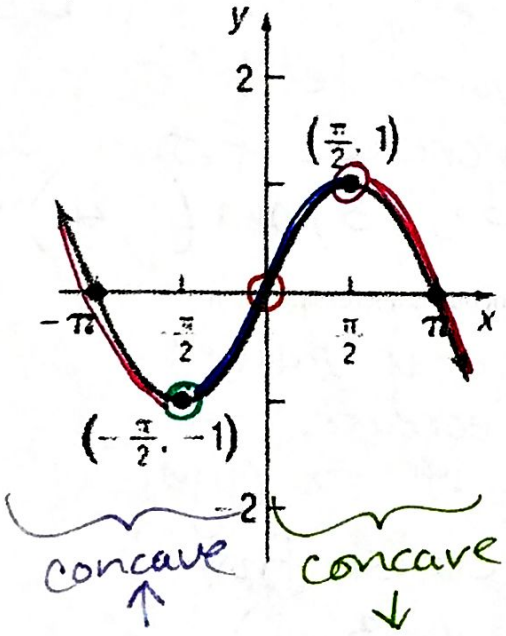
w/out calculus, this is a best guess

Ex: Estimate the point(s) of inflection and determine the intervals of concavity for the function.



Points of Inflection
(2.1, -.75) and
(3, 0) ← coordinates

Concave Up
intervals $(-\infty, 2.1)$ &
$(3, \infty)$
Concave down
$(2.1, 3)$



Ex: Name each of the following points and intervals

Local Minimum = $(-\frac{\pi}{2}, -1)$

Local Maximum= $(\frac{\pi}{2}, 1)$

Interval(s) of Increase= $(-\frac{\pi}{2}, \frac{\pi}{2})$

Interval(s) of Decrease= $(-\infty, -\frac{\pi}{2})$ & $(\frac{\pi}{2}, \infty)$

Point(s) of Inflection= $(0,0)$

Concave Up = $(-\infty, 0)$

Concave Down= $(0, \infty)$