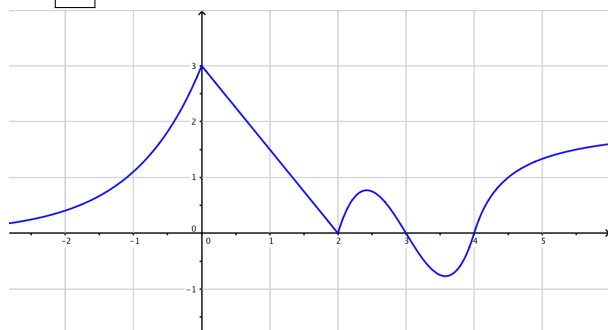


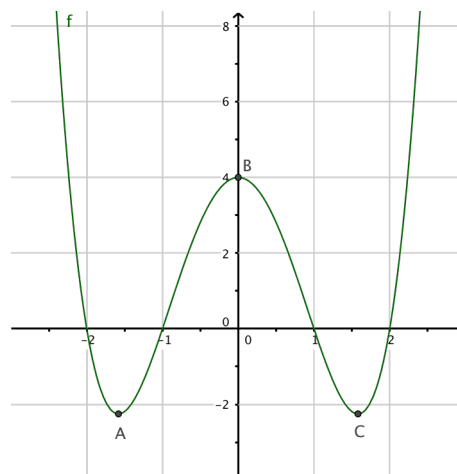
LECTURE NOTES: 4-1 MAXIMUM AND MINIMUM VALUES

MOTIVATING EXAMPLES

A



B



DEFINITIONS: Let $f(x)$ be a function with domain D and let c be an x -value in D . Then the y -value $f(c)$ is:

1. **an absolute maximum** if
2. **an absolute minimum** if
3. **a local maximum** if
4. **a local minimum** if

ARE WE ALL ON THE SAME PAGE?

1. What sort of *category* is a maximum (or minimum)? (Animal, vegetable, number, point, x -value, y -value, mineral...?)
2. Can function have more than ONE maximum (or minimum)?
3. Can a function have neither a maximum nor a minimum?
4. Looking at our earlier pictures, at what sort of places do maximums and minimums appear?
5. What happens if the graph is not continuous? Draw some pictures.

Definition: A **critical number** of a function $f(x)$ is an ____-value c _____ such that either

(a) _____ or (b) _____.

Without using your calculator, for each function below:

- a) Sketch the graph.
- b) Find any critical points or explain why none exist.
- c) Identify any absolute and local maximum and maximum values of f and state where they occur. If none exist, state this explicitly.

1. $f(x) = 5 + 54x - 2x^3$

2. $g(x) = 1 + 5 \cos x$

3. $h(x) = \ln x$ on $(0, 5]$

4. $f(x) = (x - 1)^{2/3}$ (This one you may graph on a calculator *after* you have tried the technique called “thinking about it first.”)