AUTHOR 1 ______________________

AUTHOR 2 ______________________

19 – Max & Min Values

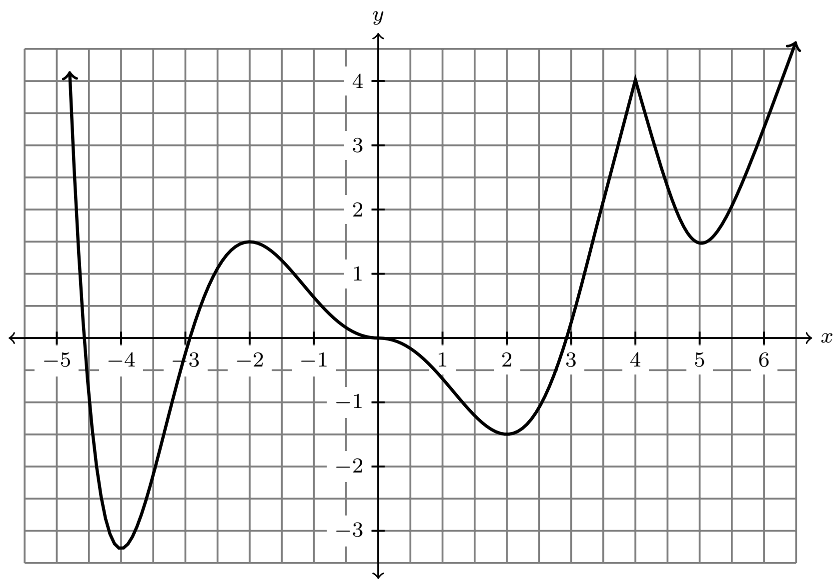
AUTHOR 3 ______________________

Definition: Absolute (or Global) Extrema

Let f be a function with domain D. Suppose c is in D.

1. $f(c)$ is called *the* **absolute minimum value** of f on D if $f(c) \leq f(x)$ for all x in D.
2. $f(c)$ is called *the* **absolute maximum value** of f on D if $f(c) \geq f(x)$ for all x in D.

1. The graph of $f(x)$ is below. Find each of the following.



(a) The absolute min value for f on $[-3, 5]$?

(b) The absolute max value for f on $[-3, 5]$?

(c) The absolute min value for f on $[0, 3.5]$?

(d) The absolute max value for f on $[0, 3.5]$?

(e) The absolute min value for f on $(0, 3.5)$?

(f) The absolute max value for f on $(0, 3.5)$?

(g) The absolute min value for f on $(-\infty, \infty)$?

(h) The absolute max value for f on $(-\infty, \infty)$?

Definition: Local Extrema

Let f be a function.

1. $f(c)$ is called a **local minimum value** of f on D if $f(c) \leq f(x)$ for all x *near* c.

2. $f(c)$ is called a **local maximum value** of f on D if $f(c) \geq f(x)$ for all x *near* c.

2. Let $f(x)$ be the same as in the previous problem.

(a) Find all local minimum values of f.

(b) Find all local maximum values of f.

3. Sketch the graph of f, and find all absolute and local extrema on its domain.

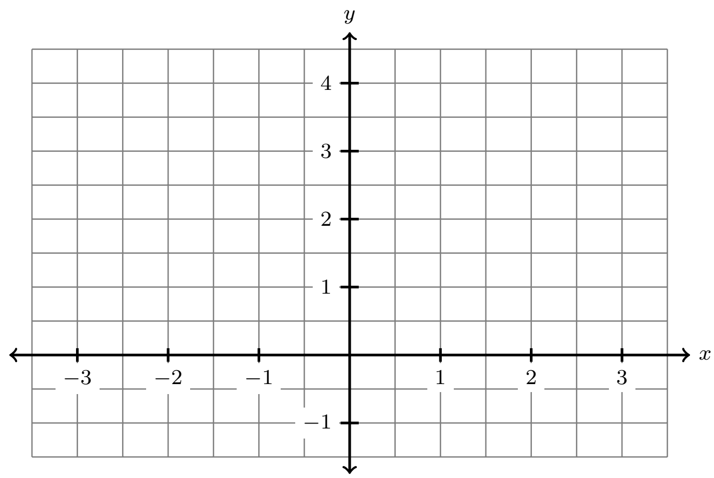
$$f(x) = \begin{cases} x^2 & \text{if } -2 \leq x \leq 1 \\ -x+2 & \text{if } x > 1 \end{cases}$$

Abs. max:

Local max's:

Abs. min:

Local min's:



4. Explain why $f(x) = e^x$ has no absolute minimum value on $(-\infty, \infty)$.

5. Explain why $g(x) = x^2$ has no absolute maximum value on $(-1, 2)$.

Theorem: Extreme Value Theorem

If f is continuous on a closed interval $[a, b]$, then f has both an absolute max and min on $[a, b]$.