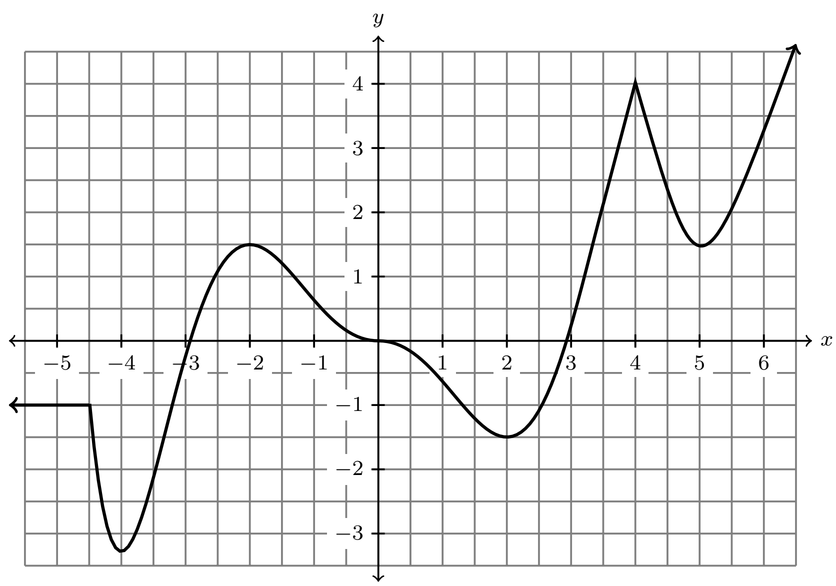
01 – Increasing/Decreasing & Relative Maxima/Minima

Definition: Increasing/Decreasing/Constant

Let f be a function and I an interval.

- f is **increasing** on I if if $f(x_1) < f(x_2)$ for all $x_1 < x_2$. *(y-values increase from left to right.)*
- f is **decreasing** on I if if $f(x_1) > f(x_2)$ for all $x_1 < x_2$. *(y-values decrease from left to right.)*
- f is **constant** on I if if $f(x_1) = f(x_2)$ for all x_1 and x_2. *(y-values stay the same.)*

1. The graph of $f(x)$ is below.



(a) On what intervals is f increasing?

(b) On what intervals is f decreasing?

(c) On what intervals is f constant?

Definition: Relative (or Local) Minima and Maxima

1. $f(c)$ is called a **relative minimum value** of f if $f(c) \leq f(x)$ for all x *near* c.
2. $f(c)$ is called a **relative maximum value** of f if $f(c) \geq f(x)$ for all x *near* c.

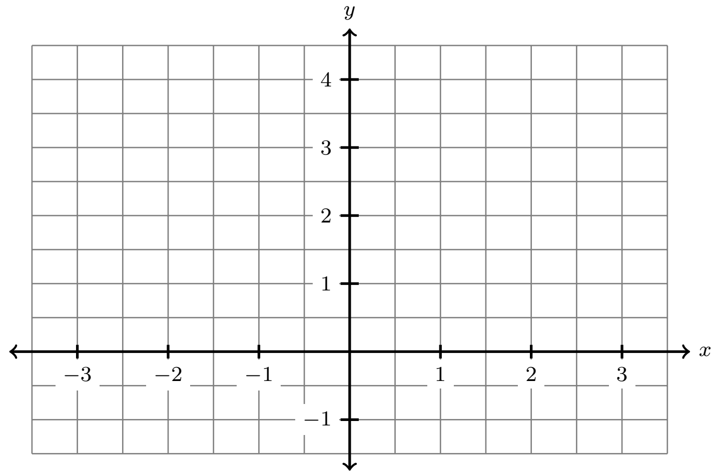
2. Let $f(x)$ be the same as in the previous problem.

(a) Find all relative minimum values of f.

(b) Find all relative maximum values of f.

3. Sketch the graph of f, and find all relative maxima and minima on its domain.

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



4. Explain why $g(x) = 3 - 2x$ has no relative maxima and no relative minima.