Functions

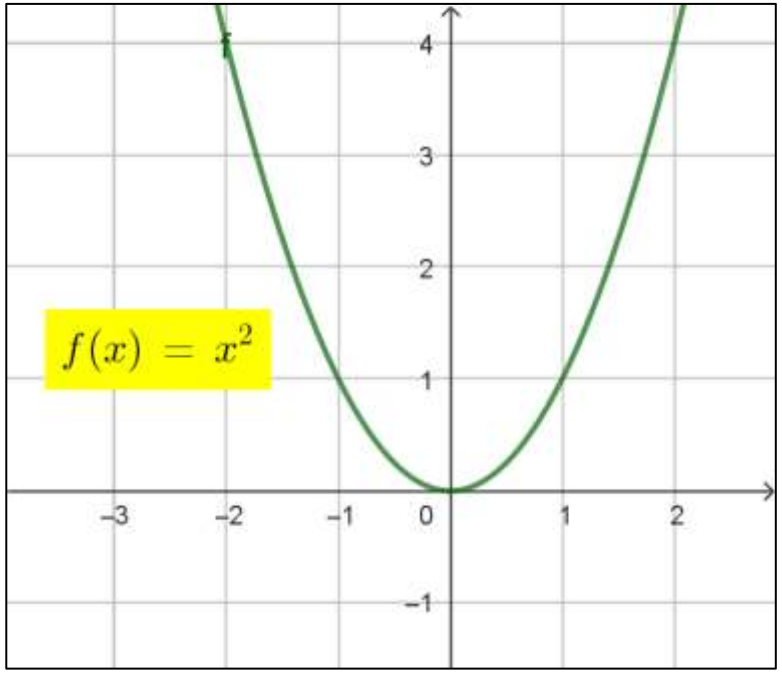
Graph of a function

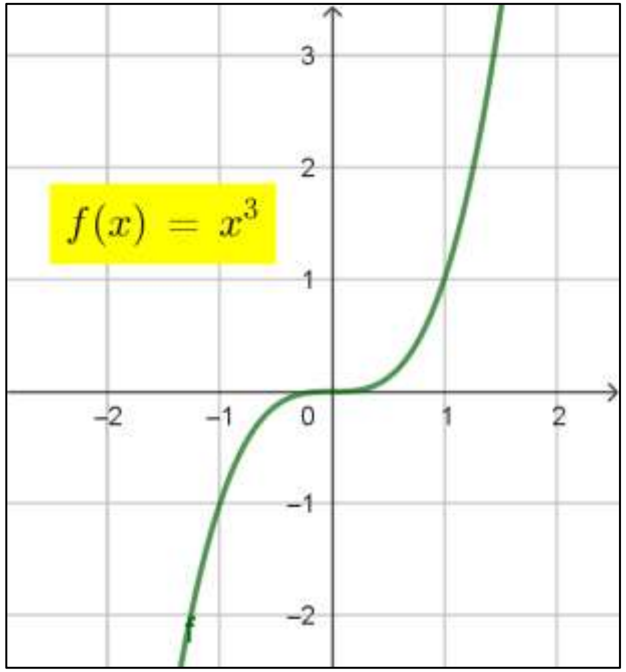
BSA
BE SMART ACADEMY

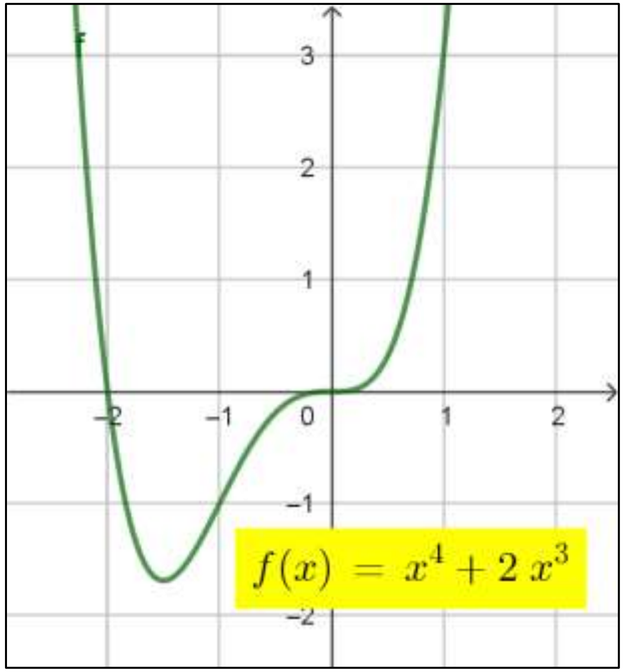
Graph of a function

We've learned that the curve is a form of representing a function f. It is the set of points of coordinates $(x; f(x))$ where $x \epsilon D_f$.

Example:







How to plot the graph of a function?

Example 1:

Consider the function f defined over IR=]-∞;+∞[by $f(x) = x^2$. Study the variations of f and plot its curve (Cf).

1. Limits at the endpoints:

$$\lim_{x\to+\infty} f(x) = \lim_{x\to+\infty} x^2 = +\infty \quad ; \quad \lim_{x\to-\infty} f(x) = \lim_{x\to-\infty} x^2 = +\infty$$

2. Derivative + zeroes of $f'(x)$:

$$f'(x) = 2x$$

$$f'(x) = 0 \quad ; \quad 2x = 0 \quad ; \quad x = \frac{0}{2} = 0 \qquad y = 0^2 = 0$$

How to plot the graph of a function?

Example 1:

3. Table of variations.

x	$-\infty$		0		$+\infty$
$f'(x)$		$-$	0	$+$	
$f(x)$	$+\infty$	↘	0	↗	$+\infty$

4. Particular points if they exist

The particular points are the intersecting points with axes of coordinates:

$(x'x)$: for $y = 0$; $x^2 = 0$; $x = 0$

$(y'y)$: for $x = 0$; $y = 0$

So 1 p.p. (0;0)

How to plot the graph of a function?

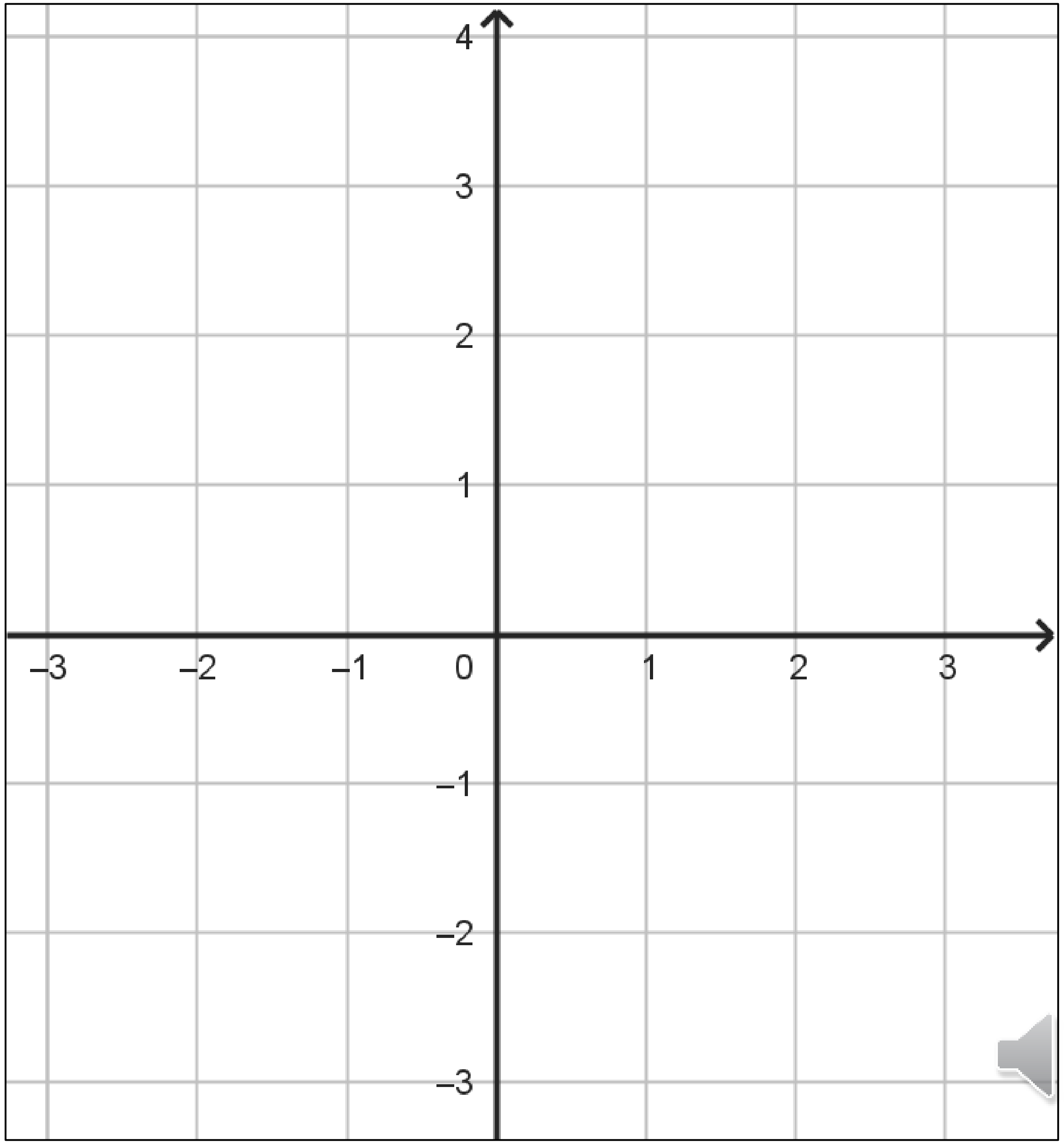
Example 1:

5. Plot the curve

Note that:

The curve of f is a reflection to the table of variations of f.

x	$-\infty$		0		$+\infty$
$f'(x)$		$-$	0	$+$	
$f(x)$	$+\infty$	↘	0	↗	$+\infty$



How to plot the graph of a function?

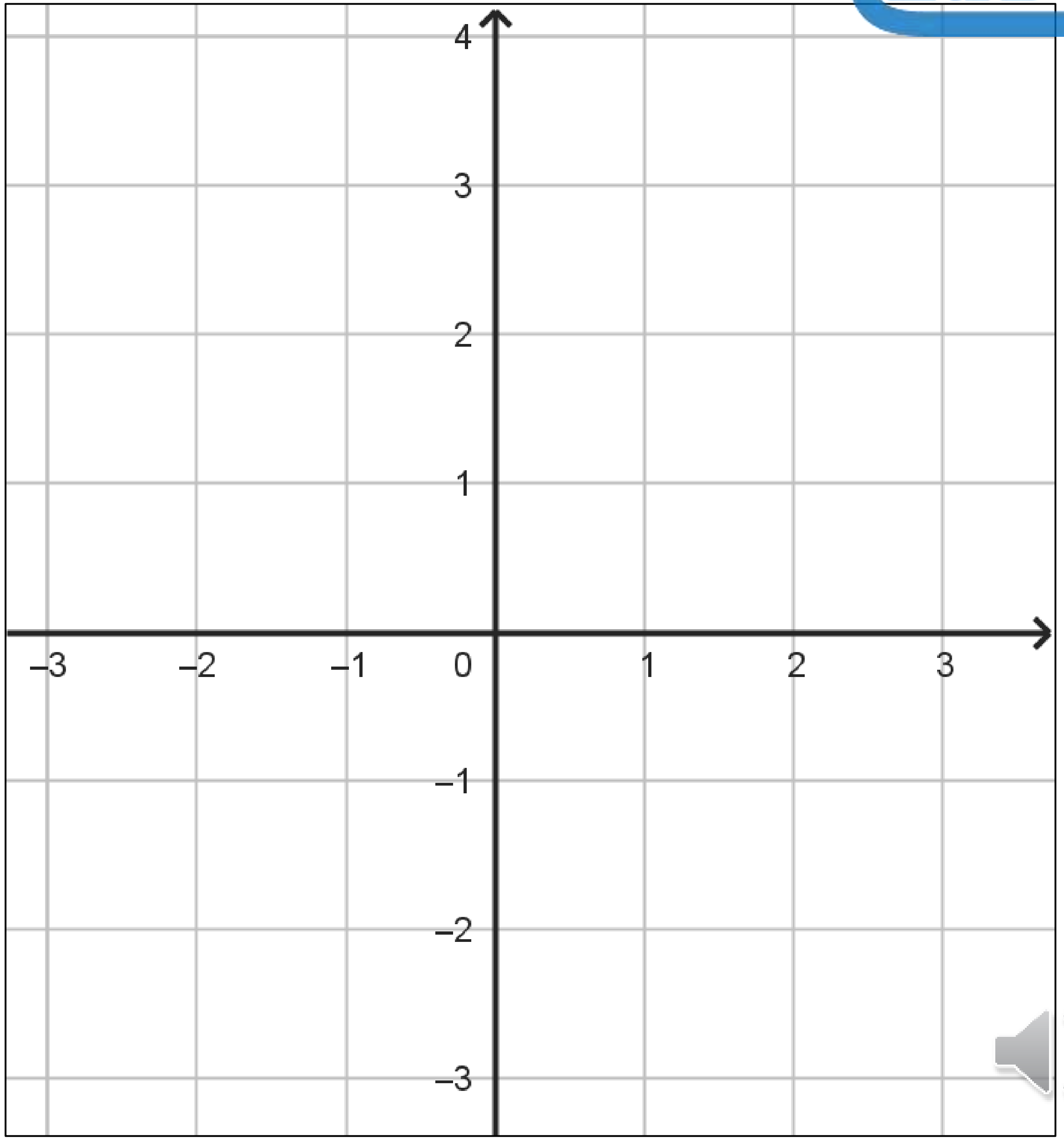
Example 1:

5. Plot the curve

Note that:

The curve of f is a reflection to the table of variations of f.

x	$-\infty$		0		$+\infty$
$f'(x)$		$-$	0	$+$	
$f(x)$	$+\infty$	↘	0	↗	$+\infty$

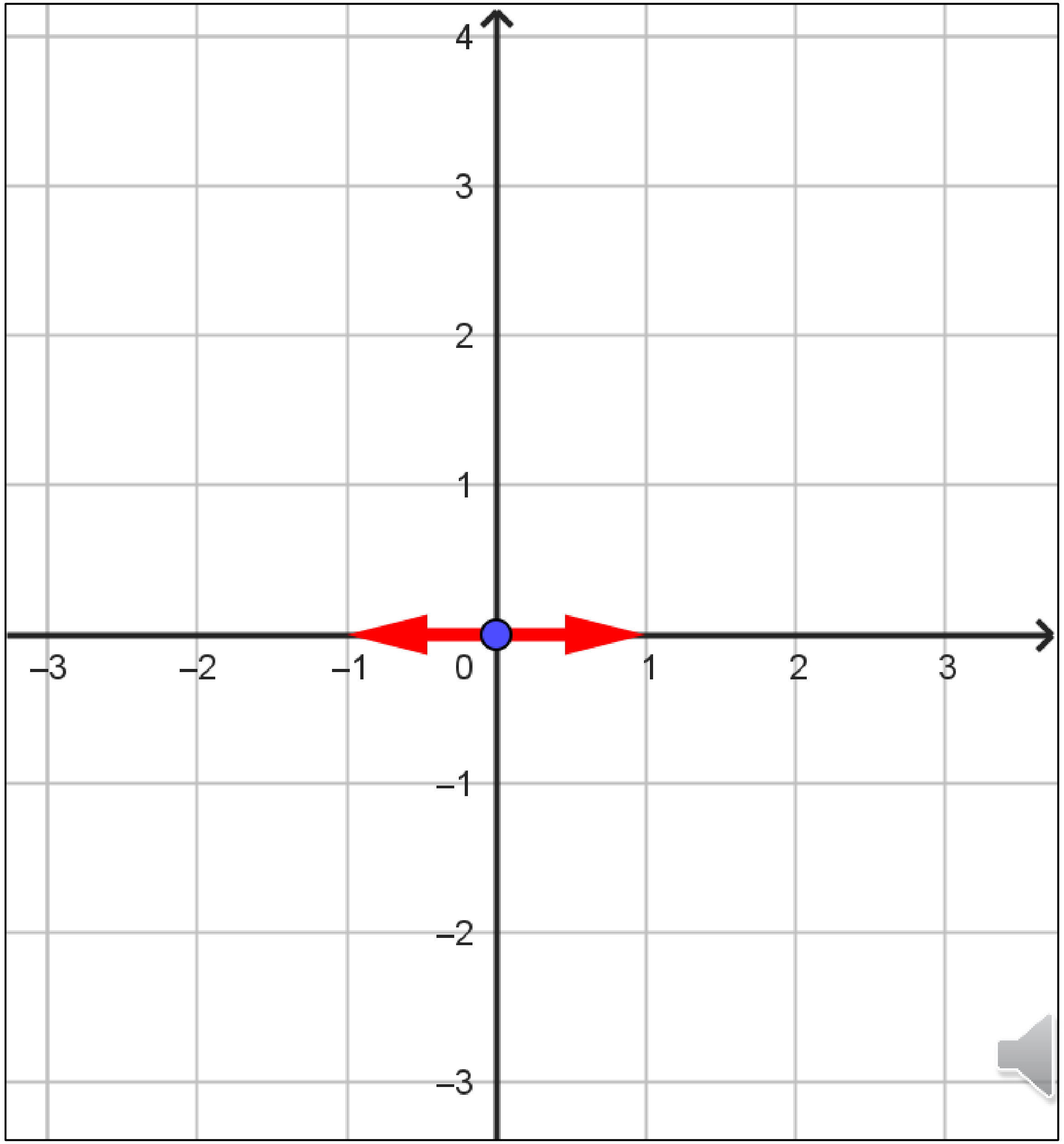


How to plot the graph of a function?

Example 1:

5. Plot the curve

x	$-\infty$		0		$+\infty$
$f'(x)$		$-$	0	$+$	
$f(x)$	$+\infty$	$\searrow$	0	$\nearrow$	$+\infty$



After plotting the extrema, plot the particular points. But in this case the particular is same the extremum

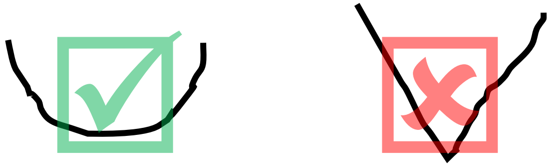
How to plot the graph of a function?

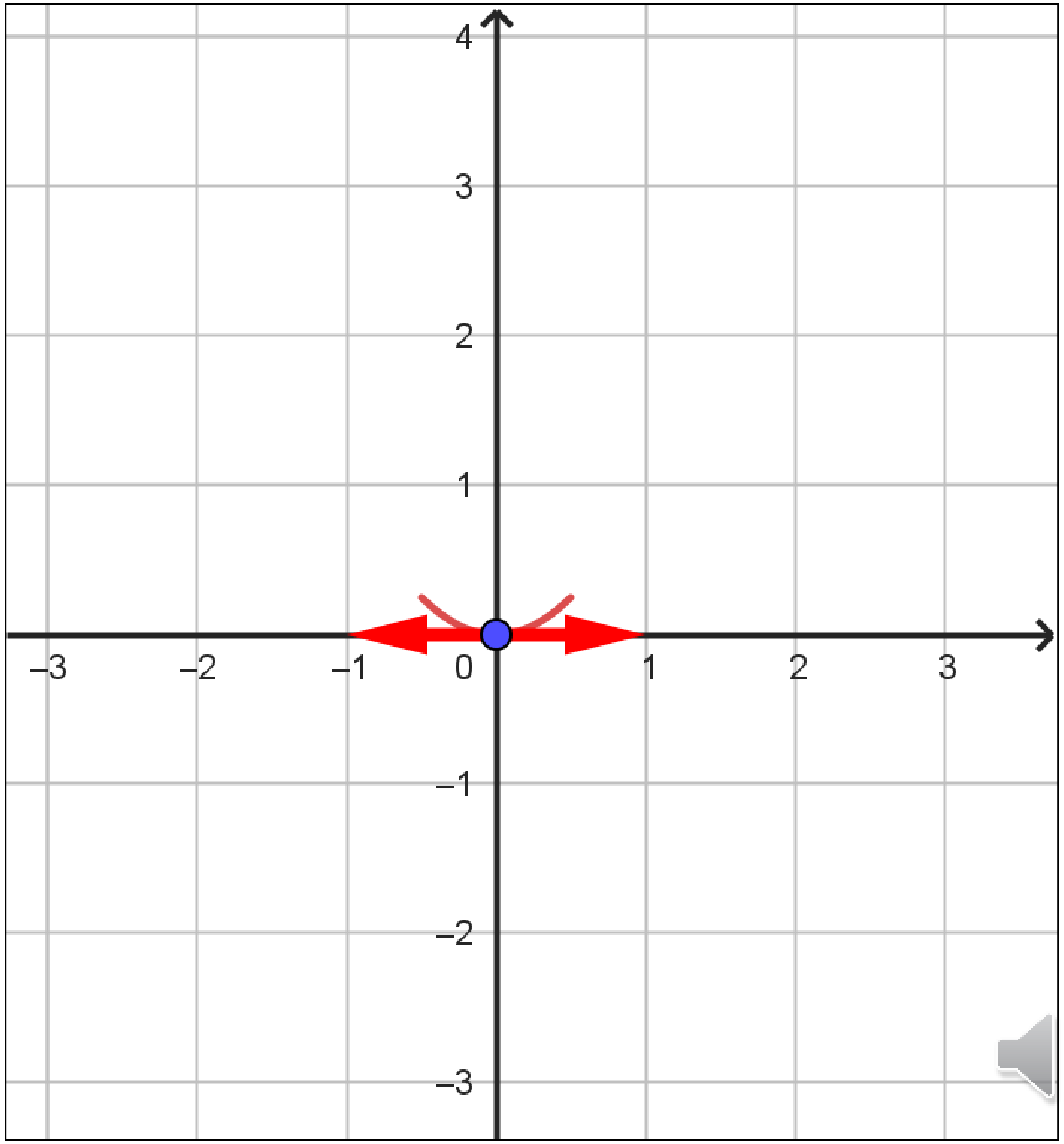
Example 1:

5. Plot the curve

x	$-\infty$		0		$+\infty$
$f'(x)$		$-$	0	$+$	
$f(x)$	$+\infty$	↘	0	↗	$+\infty$

Note that at the local extremum the curve must not be sharp.





How to plot the graph of a function?

Example 1:

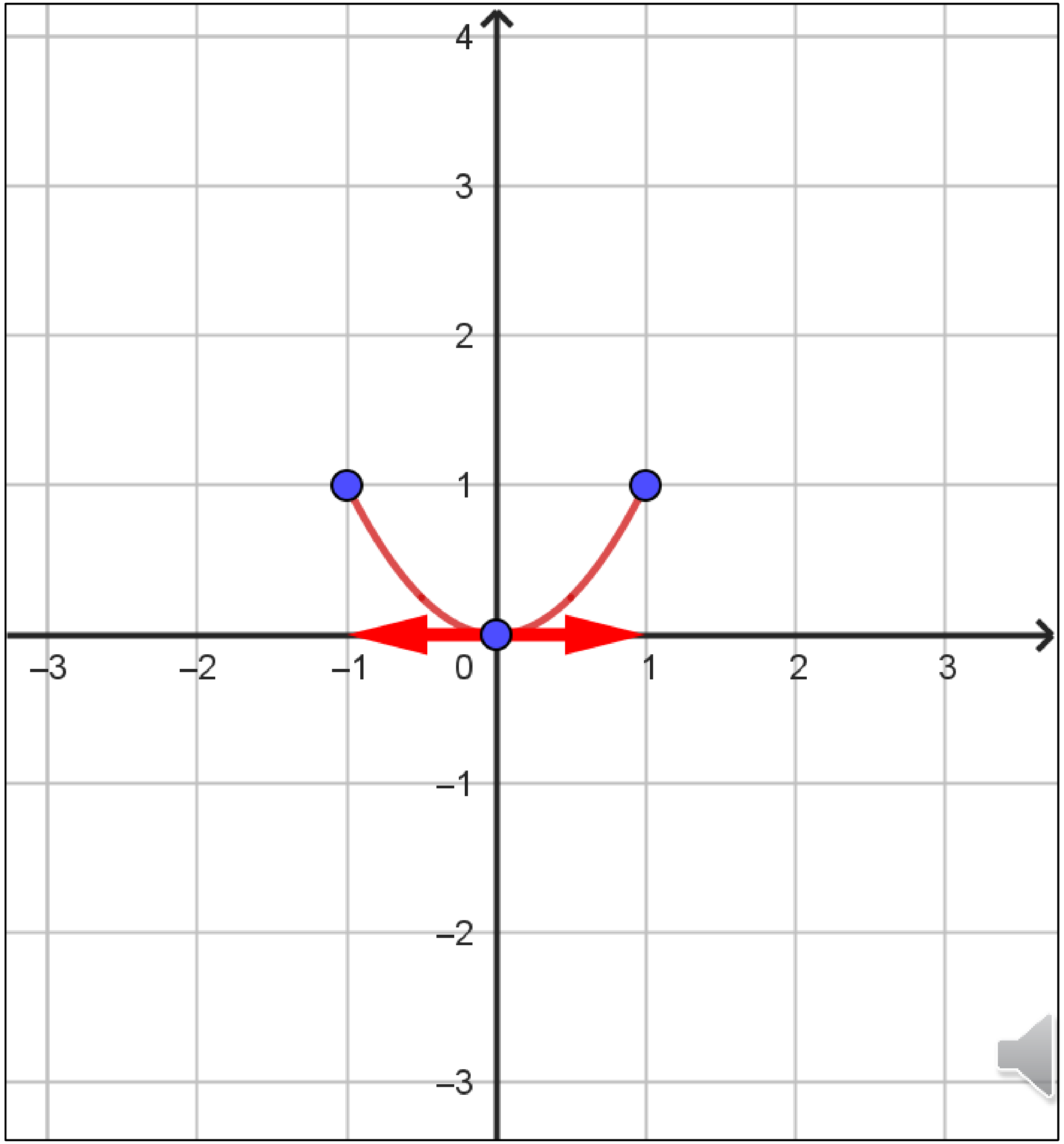
5. Plot the curve

x	$-\infty$		0		$+\infty$
$f'(x)$		$-$	0	$+$	
$f(x)$	$+\infty$	↘	0	↗	$+\infty$

To help in drawing, we can find some helping points:

for $x = -1\,;\;\; y = (-1)^2 = 1$

for $x = 1\,;\;\; y = (1)^2 = 1$

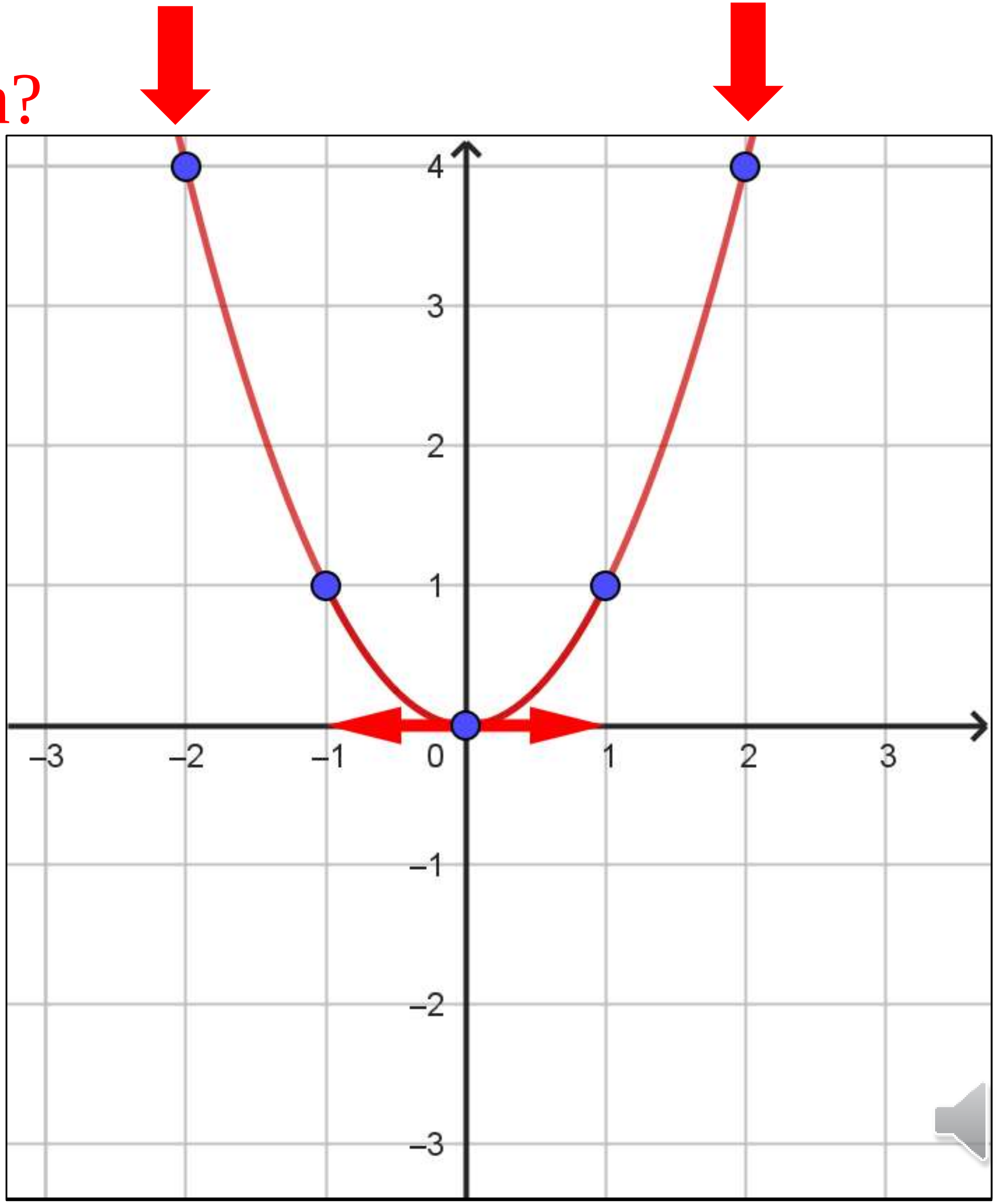


How to plot the graph of a function?

Example 1:

5. Plot the curve

x	$-\infty$		0		$+\infty$
$f'(x)$		$-$	0	$+$	
$f(x)$	$+\infty$	↘	0	↗	$+\infty$



Remark:

Don't stop at a point, draw a part of the curve after the point to represent infinity branches.

How to plot the graph of a function?

Example 2:

Consider the function f defined over IR=]-∞;+∞[by $f(x) = x^3 - 3x^2 + 3$.

Study the variations of f and plot its curve (Cf).

1. Limits at the endpoints:

$\lim_{x\to+\infty} f(x) = \lim_{x\to+\infty} x^3 = +\infty$; $\lim_{x\to-\infty} f(x) = \lim_{x\to-\infty} x^3 = -\infty$

2. Derivative + zeroes of $f'(x)$:

$f'(x) = 3x^2 - 6x$

$f'(x) = 0$; $3x^2 - 6x = 0$; $3x(x-2) = 0$; $x = 0$ or $x = 2$

$y = 3$ $y = -1$

BSA
BE SMART ACADEMY

How to plot the graph of a function?

Example 2:

3. Table of variations.

x	$-\infty$		0		2		$+\infty$
$f'(x)$		$+$	0	$-$	0	$+$	
$f(x)$	$-\infty$	↗	3	↘	-1	↗	$+\infty$

4. Particular points if they exist

$(x'x)$: for $y = 0$; $x^3 - 3x^2 + 3 = 0$

Using calculator:

$x \approx -0.9$; $x \approx 1.3$; $x \approx 2.5$

$(y'y)$: for $x = 0$; $y = 3$

So 4 p.p.:

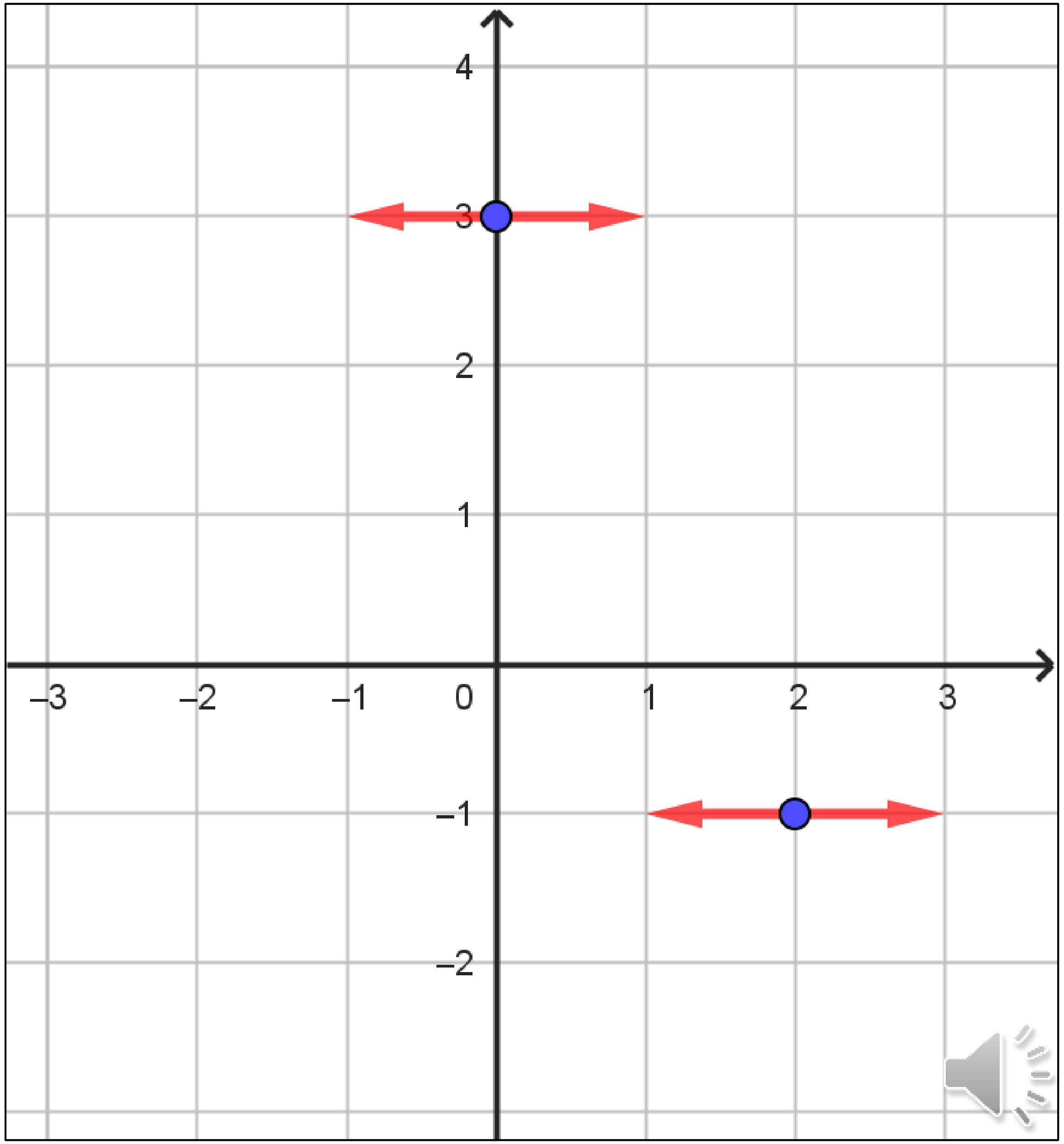
(0;3) ; (-0.9;0) ; (1.3;0) ; (2.5 ; 0)

How to plot the graph of a function?

Example 1:

5. Plot the curve

x	$-\infty$		0		2		$+\infty$
$f'(x)$		$+$	0	$-$	0	$+$	
$f(x)$	$-\infty$	$\nearrow$	3	$\searrow$	-1	$\nearrow$	$+\infty$



How to plot the graph of a function?

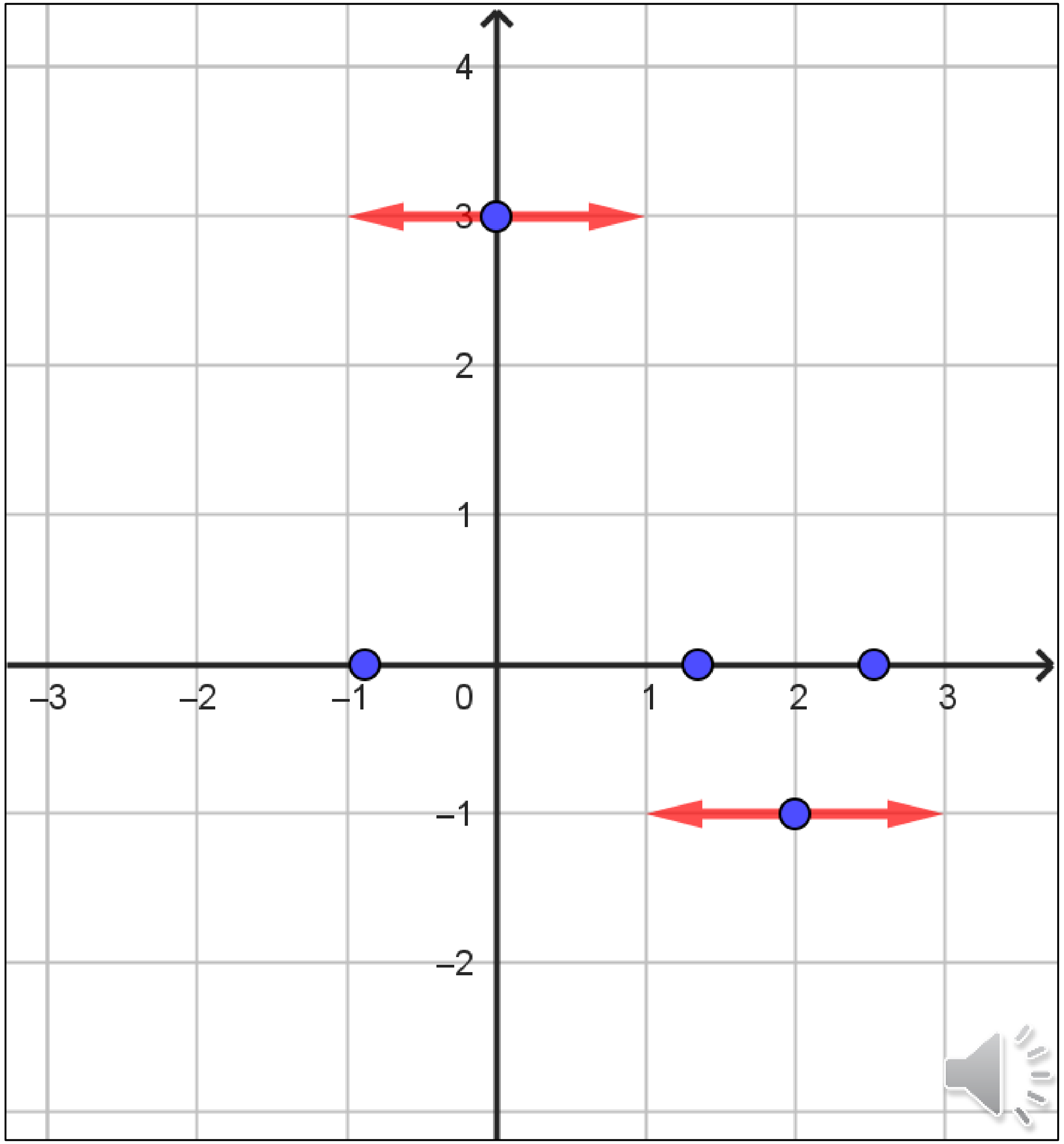
Example 1:

5. Plot the curve

x	$-\infty$		0		2		$+\infty$
$f'(x)$		$+$	0	$-$	0	$+$	
$f(x)$	$-\infty$	↗	3	↘	-1	↗	$+\infty$

Plotting the P.P.

(0;3) ; (-0.9;0) ; (1.3;0) ; (2.5 ; 0)

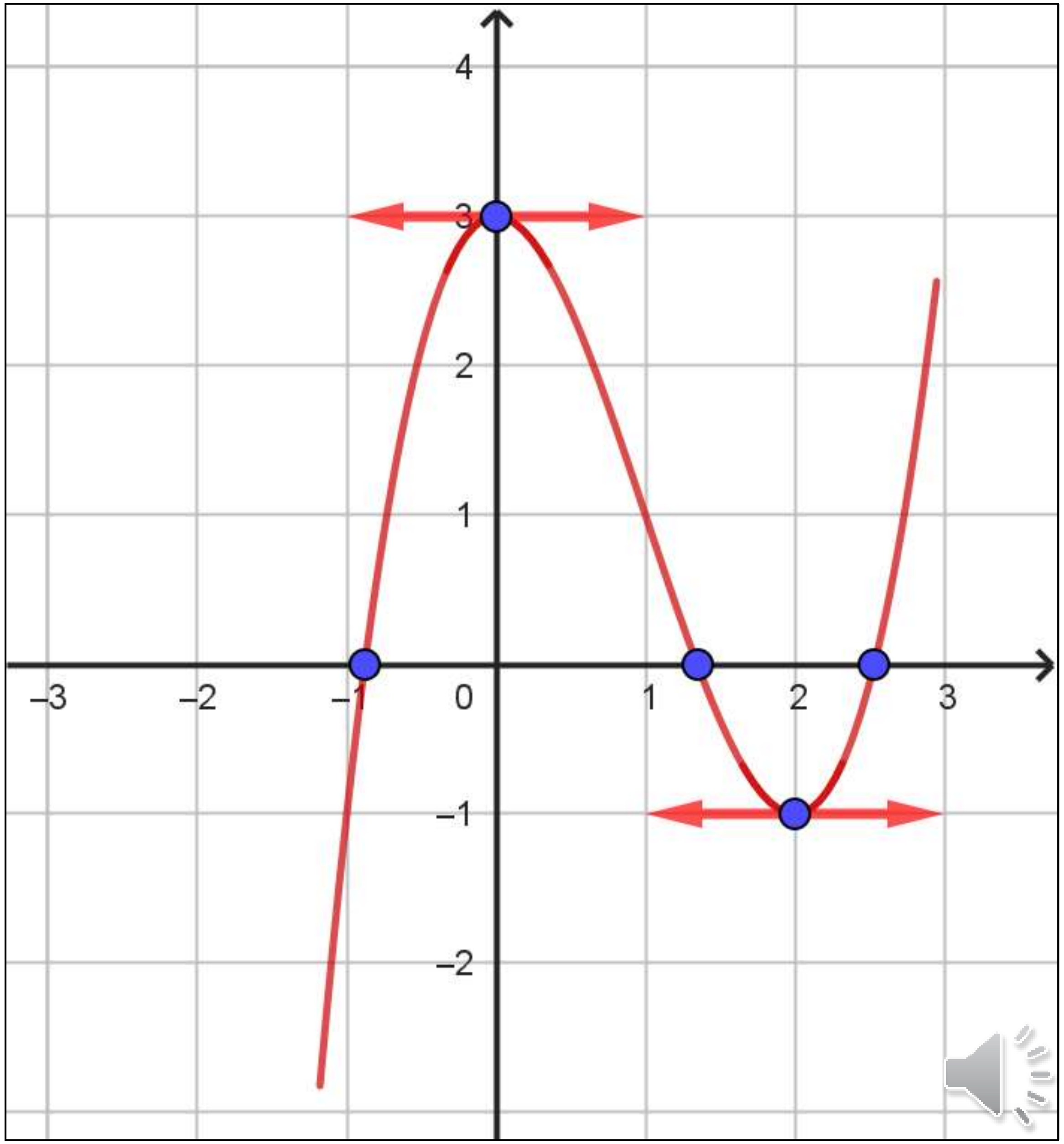


How to plot the graph of a function?

Example 1:

5. Plot the curve

x	$-\infty$		0		2		$+\infty$
$f'(x)$		$+$	0	$-$	0	$+$	
$f(x)$	$-\infty$	↗	3	↘	-1	↗	$+\infty$



Start by the extrema.

Continue according to the table of variations