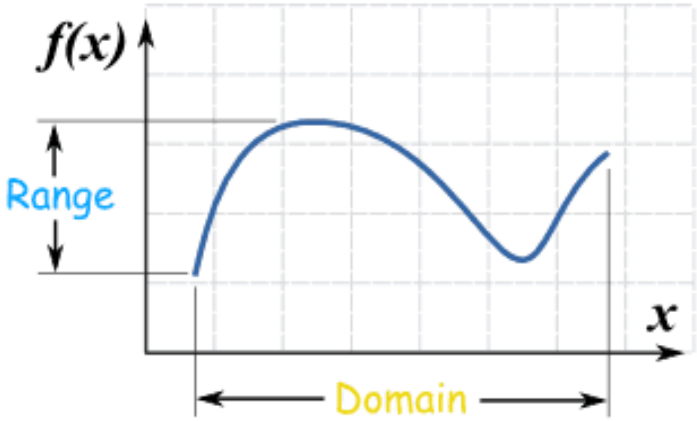
2.3 Getting Information from the Graph of a Function

Finding the domain and range from a graph



Example 1 $y = \sqrt{r^2 - x^2}$ semicircle

Sketch the graph of $f(x) = \sqrt{25 - x^2}$.

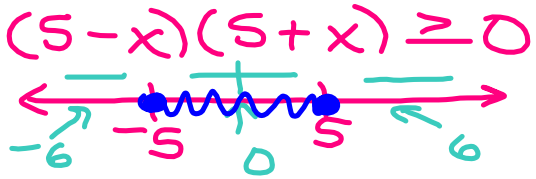
Then find the domain and range of $f(x)$.

D: $[-5, 5]$

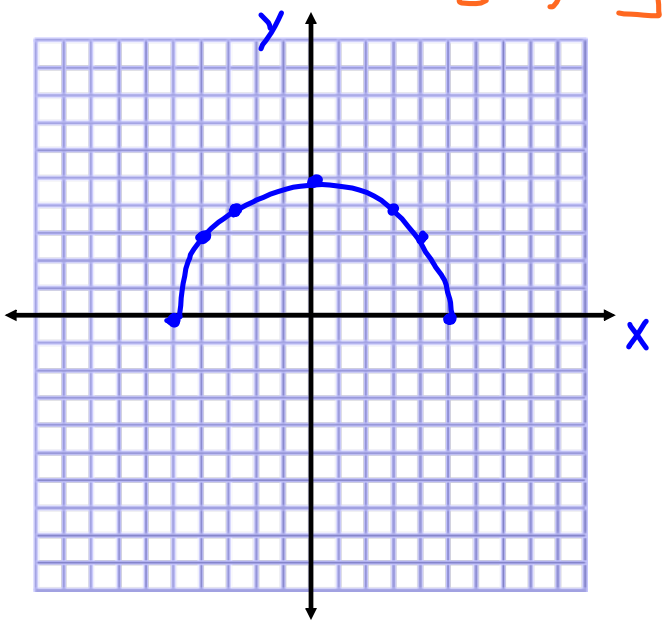
R: $[0, 5]$

$25 - x^2 \geq 0$

$(5 - x)(5 + x) \geq 0$



x	y
-5	$\sqrt{0} = 0$
-4	$\sqrt{9} = 3$
-3	$\sqrt{16} = 4$
0	$\sqrt{25} = 5$
3	$\sqrt{16} = 4$
4	$\sqrt{9} = 3$
5	$\sqrt{0} = 0$

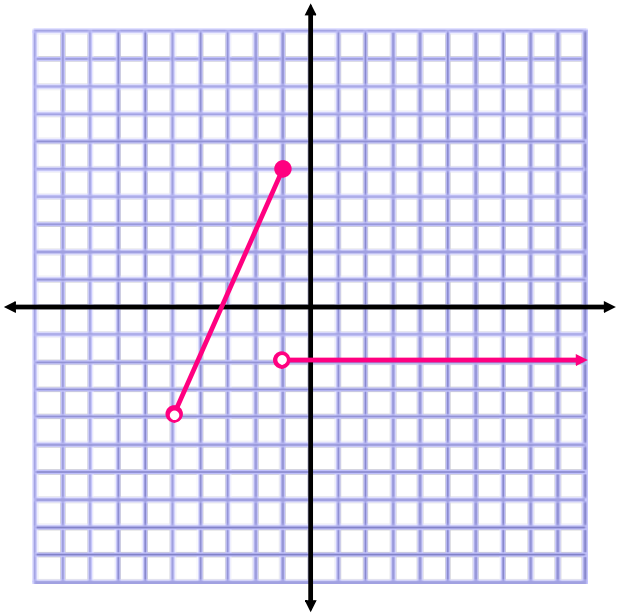


Example 2

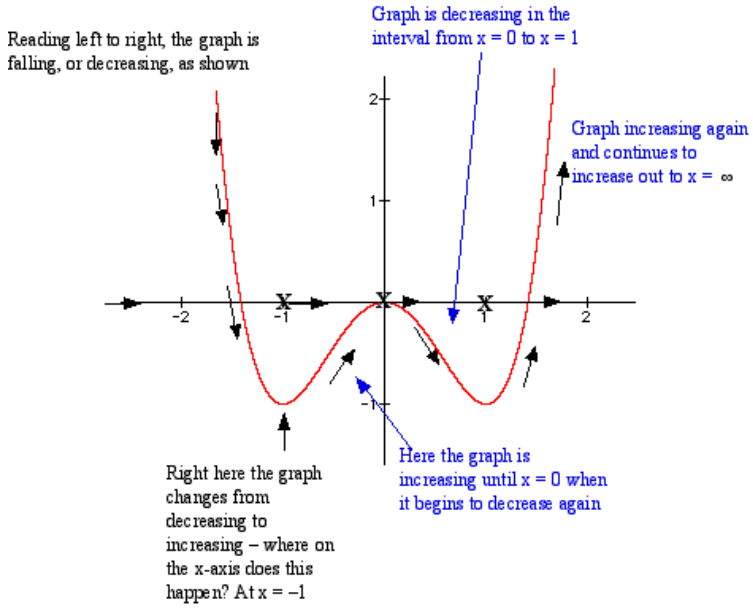
Find the domain and range of f(x).

D: $(-5, \infty)$

R: $(-4, 5]$



A function is increasing when its graph rises and decreasing when its graph falls.

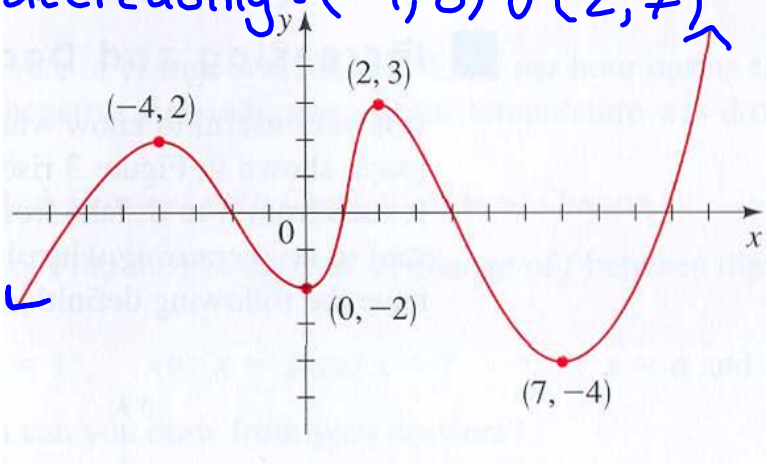


Example 3 x-values only

State the intervals on which the function whose graph is shown below is increasing or decreasing.

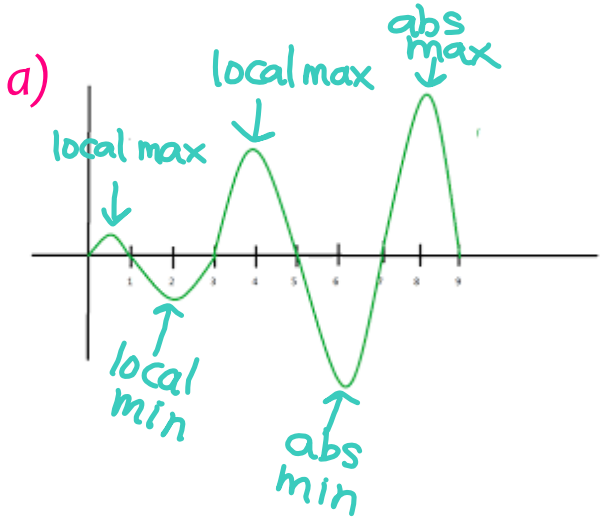
increasing : $(-\infty, -4) \cup (0, 2) \cup (7, \infty)$

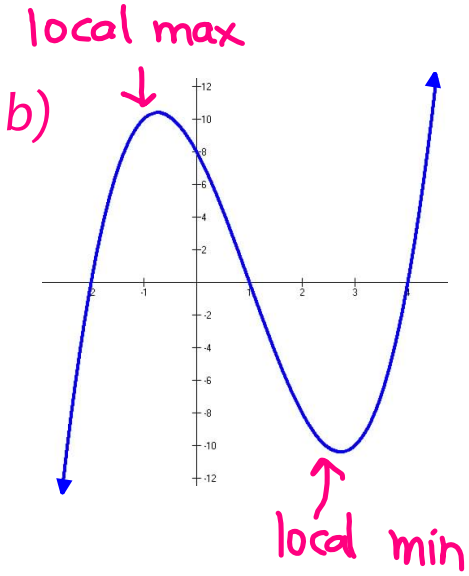
decreasing : $(-4, 0) \cup (2, 7)$



Example 4

Identify all local maximums, local minimums, absolute maximum, and absolute minimum.





To find a local maximum/minimum on a graphing calculator:

1. Type the function into y = .
2. Look at graph. Maybe change window.
3. To find the local max/min, we need to use the CALC menu. To get there, we need to push 2nd TRACE and choose which you'd like to find first.
4. The calculator asks for left bound first, so using the arrow keys move to the left side of the max/min point. Then push enter.
5. The calculator now asks for right bound, so using the arrow keys move to the right side of the max/min point. Push enter.
6. The calculator now "guesses." We don't want a guess, so push enter one more time.

Example 5

For the function $f(x) = x^{2/3}$,

a) Find all the local maximum and minimum values.

b) Find the intervals on which the function is increasing and decreasing. x-values

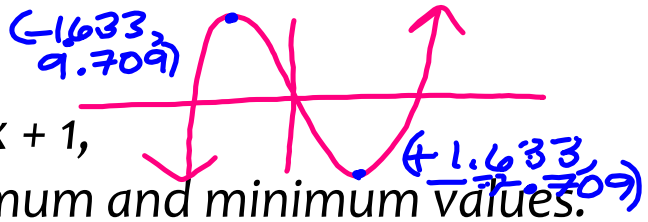
c) Find the domain and range.

a) local min/abs min = 0 when x = 0

b) decreasing $(-\infty, 0)$
increasing $(0, \infty)$

c) D: $(-\infty, \infty)$
R: $[0, \infty)$

Example 6



For the function $y = x^3 - 8x + 1$,

a) Find all the local maximum and minimum values.

b) Find the intervals on which the function is increasing and decreasing.

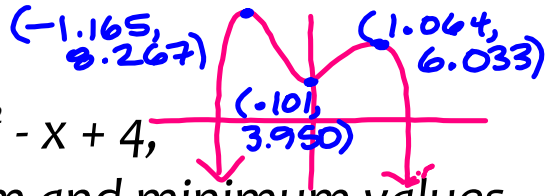
c) Find the domain and range.

a) local max ≈ 9.709 when $x \approx -1.633$
local min ≈ -7.709 when $x \approx 1.633$

b) increasing $(-\infty, -1.633) \cup (1.633, \infty)$
decreasing $(-1.633, 1.633)$

c) D: $(-\infty, \infty)$
R: $(-\infty, \infty)$

Example 7



For the function $y = -2x^4 + 5x^2 - x + 4$,

a) Find all the local maximum and minimum values.

b) Find the intervals on which the function is increasing and decreasing.

c) Find the domain and range.

a) abs max ≈ 8.267 when $x \approx -1.165$
local min ≈ 3.950 when $x \approx .101$
local max ≈ 6.033 when $x \approx 1.064$

b) increasing $(-\infty, -1.165) \cup (.101, 1.064)$
decreasing $(-1.165, .101) \cup (1.064, \infty)$

c) D: $(-\infty, \infty)$
R: $(-\infty, 8.267]$