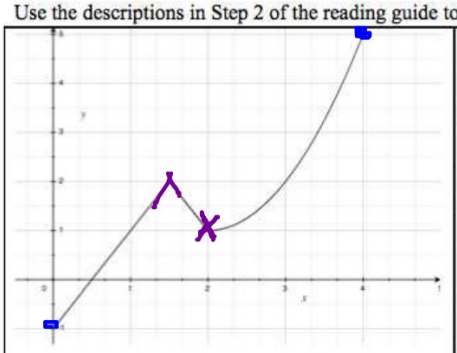
Reading Guide for Function Extrema

minimum
maximum

Use the descriptions in Step 2 of the reading guide to classify all the extrema of the depicted graph.



The function has a global or absolute maximum of 5 when x = 4, because all other y values are less than 5.

The function has an absolute or global minimum of -1 when x = 0, because all other y values are greater than -1.

The function has a local or relative max. of 2 when x = 1.5, because it is the greatest y value on the interval [0,2].

The function has a local or relative minimum of 1 when x = 2, because it is the lowest y value on the interval [1.5, 4].

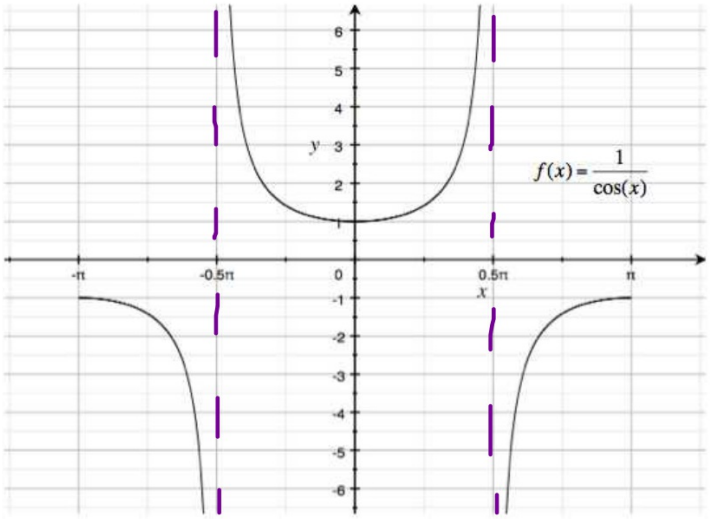
The function is bounded, because the function is bounded above and bounded below.

A lower bound for the function is $y =$ -1. An upper bound for the function is $y =$ 5.

Practice

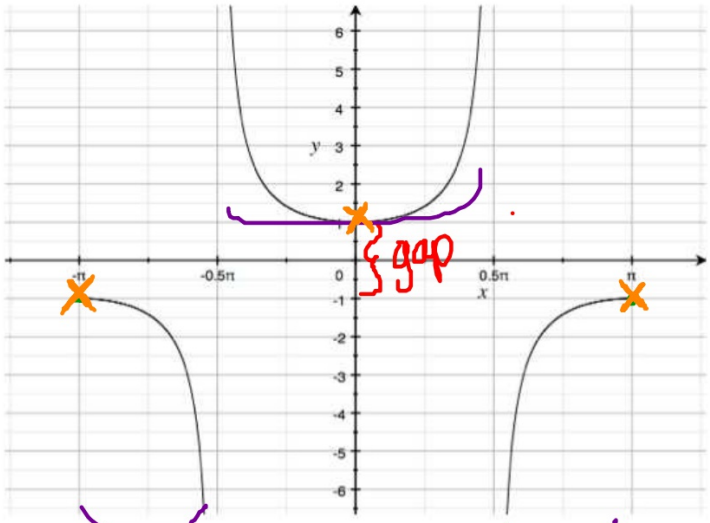
- Let $f(x)=\frac{1}{\cos(x)}$. Use the graph to answer the following questions.

  a) What is equation for the vertical asymptote of f?



$x = -0{,}5\pi$

$x = 0.5\pi$

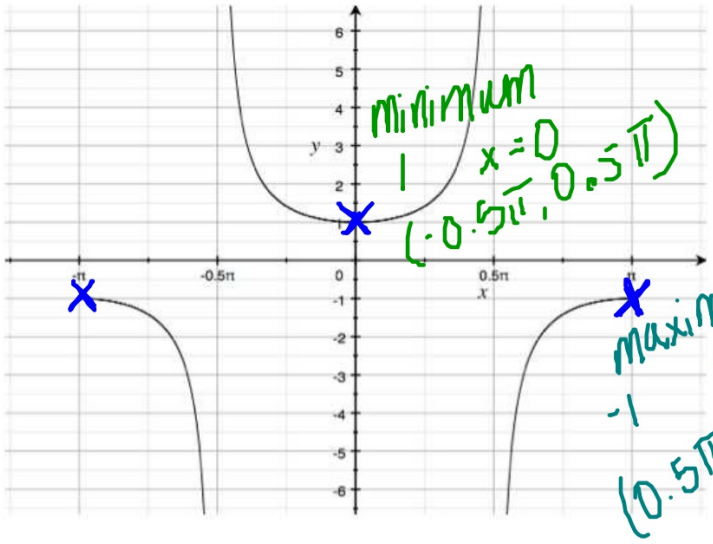


b) What is the domain of *f(x)* ?

$[-\pi, -0.5\pi) \cup (-0.5\pi, 0.5\pi) \cup (0.5\pi, \pi]$

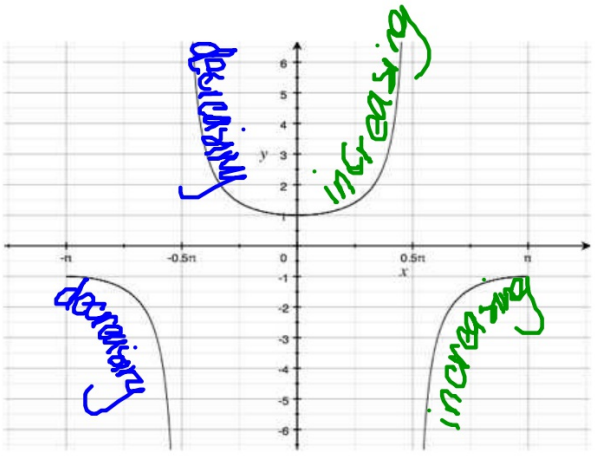
c) What is the range of *f(x)* ?

$(-\infty, -1] \cup [1, \infty)$



d) What are the local maximum and minimum values of the function and where do they occur? Label the points on the graph.

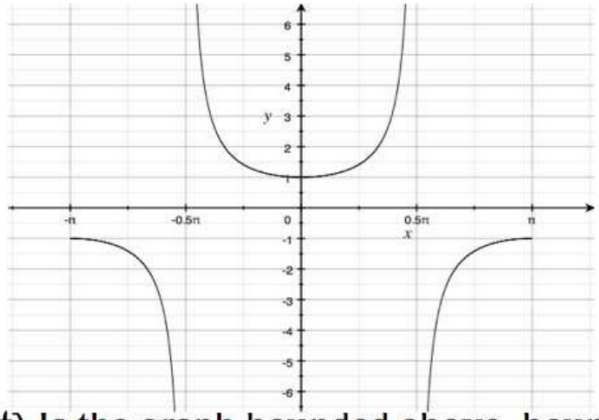
There is a local maximum of -1 when $x = -\pi$ on the interval $[-\pi, -0.5\pi)$.



e) On what intervals is the function's graph increasing, decreasing, or constant? Justify with key words in complete sentences.

The function is increasing on the interval $[0, 0.5\pi) \cup (0.5\pi, \pi]$

The function is decreasing on the interval $[-\pi, -0.5\pi) \cup (-0.5\pi, 0]$



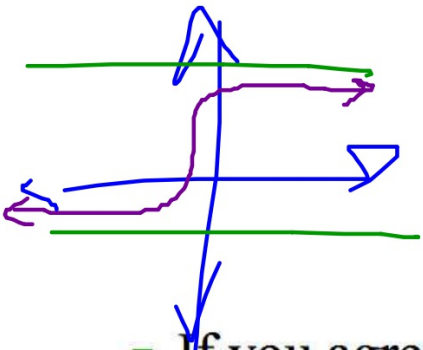
f) Is the graph bounded above, bounded below, bounded or unbounded? Justify with key words in complete sentences.

The function has y values that go to $\pm\infty$. ∴ the function is unbounded

Counterexample

Agree or Disagree and **WHY?**

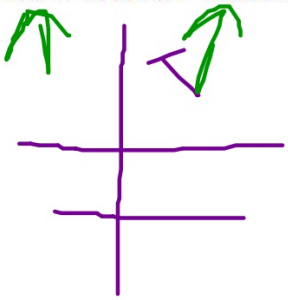
- All bounded functions have absolute extrema.



- If you agree, give a mathematical reason.
- If you disagree, provide a **counterexample**.

Agree or Disagree and **WHY?**

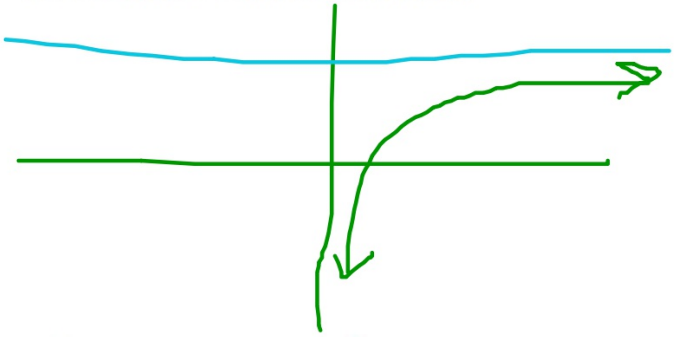
- If a function is bounded below, it will have an absolute maximum.



- If you agree, give a mathematical reason.
- If you disagree, provide a **counterexample**.

Agree or Disagree and **WHY?**

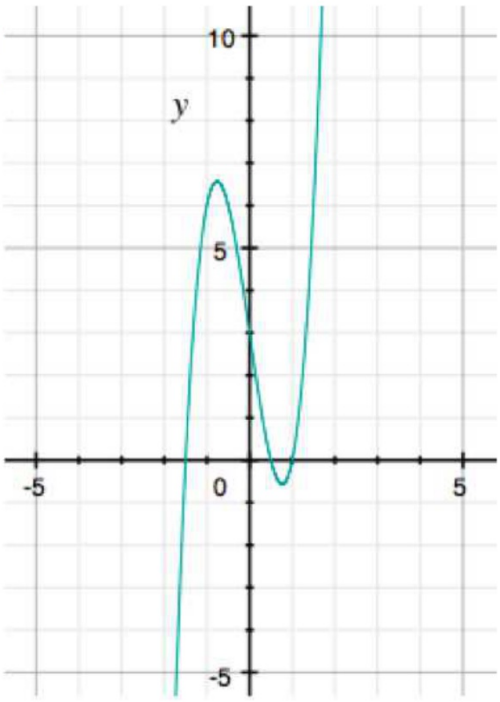
- If a function is bounded above, it will have an absolute maximum.



- If you agree, give a mathematical reason.
- If you disagree, provide a **counterexample**.

Agree or Disagree and **WHY?**

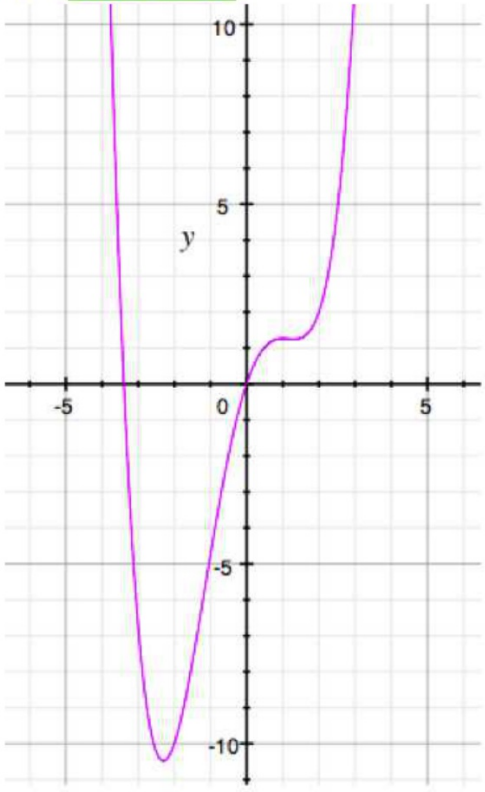
- This function has an absolute maximum near the y value 6.5.



- If you agree, give a mathematical reason.
- If you disagree, provide a **counterexample**.

Agree or Disagree and **WHY?**

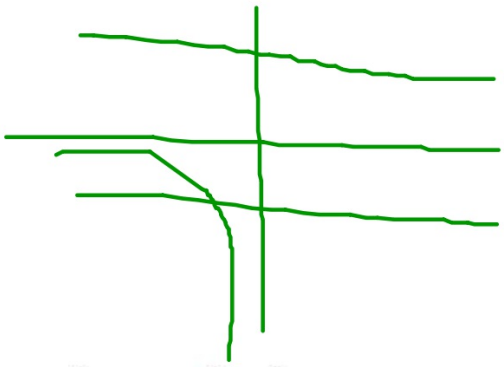
- This function has a global minimum near y=-10.



- If you agree, give a mathematical reason.
- If you disagree, provide a **counterexample**.

Agree or Disagree and **WHY?**

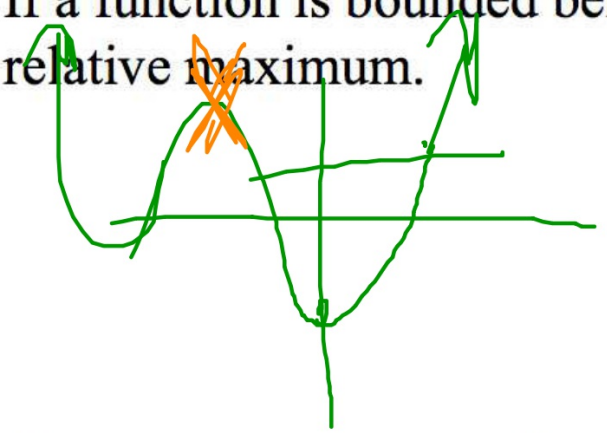
- If a function is bounded above, it can have an absolute minimum.



- If you agree, give a mathematical reason or an example.
- If you disagree, provide a **counterexample**.

Agree or Disagree and **WHY?**

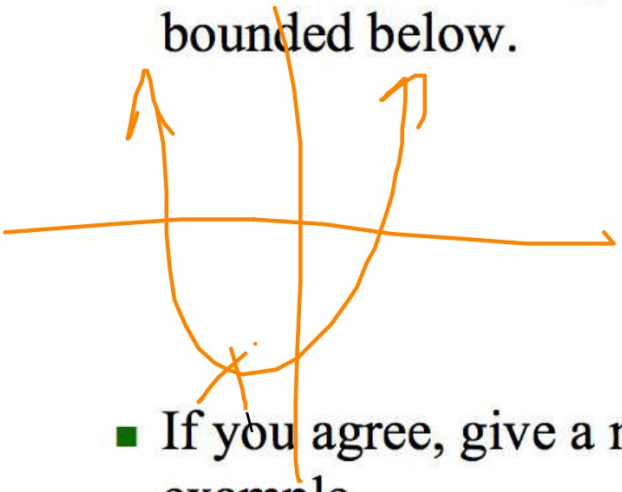
- If a function is bounded below, it can have a relative maximum.



- If you agree, give a mathematical reason or example.
- If you disagree, provide a **counterexample**.

Agree or Disagree and **WHY?**

- If a function has a global minimum, it is bounded below.



- If you agree, give a mathematical reason or example.
- If you disagree, provide a **counterexample**.