

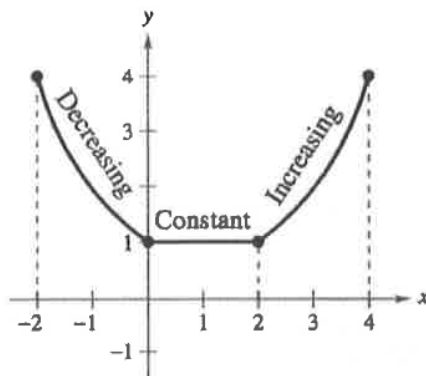
Lesson 1.5 - Defining Increasing and Decreasing Intervals

Learning Objectives: SWBAT

- Define increasing and decreasing intervals of a function graph
- Identify the existence of relative maxima/minima of a function given its graph

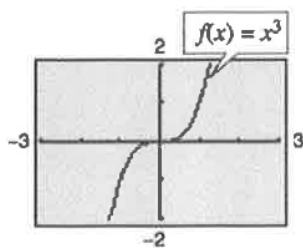
Review: **Identifying Increasing/Decreasing Intervals**

- An interval of a function is **INCREASING** if its slope is positive
- An interval of a function is **DECREASING** if its slope is negative
- An interval of a function is **CONSTANT** if its slope is zero
- Always define increasing/decreasing intervals using "x" values (look left to right)
- See the figure below for each case

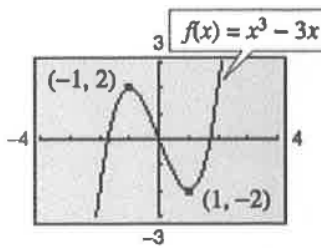


- This function is decreasing on the interval $[-2, 0]$
- This function is constant on the interval $[0, 2]$
- This function is increasing on the interval $[2, 4]$

Your Turn: Define the increasing/decreasing/constant intervals for the following:

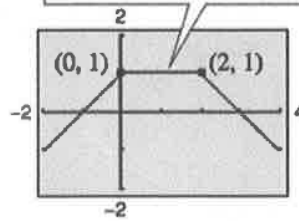


(a)



(b)

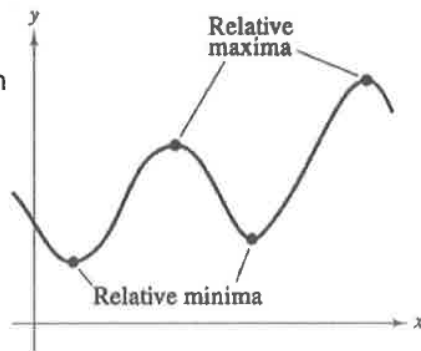
$$f(x) = \begin{cases} x+1, & x < 0 \\ 1, & 0 \leq x \leq 2 \\ -x+3, & x > 2 \end{cases}$$



(c)

Review: **Relative Maxima/Minima**

- A relative Maxima (max) is a turning point on a graph where the slope goes from **positive to negative**.
The slope at the point itself is zero
- A relative Minima (min) is a turning point on a graph where the slope goes from **negative to positive**.
The slope at the point itself is zero



Lesson 1.5 - Defining Increasing and Decreasing Intervals

Practice: Use DESMOS to graph each function. After graphing determine the intervals upon which the function is increasing, decreasing or constant

23. $f(x) = 3$

Constant $(-\infty, \infty)$

24. $f(x) = x$

increasing
 $(-\infty, \infty)$

25. $f(x) = x^{2/3}$

Decreasing $(-\infty, 0)$
increasing $(0, \infty)$

27. $f(x) = x\sqrt{x+3}$

decreasing $(-3, -2)$
increasing $(-2, \infty)$

28. $f(x) = \sqrt{1-x}$

decreasing $(-\infty, 1)$

29. $f(x) = |x+1| + |x-1|$

Decreasing $(-\infty, -1)$
Constant $(-1, 1)$
increasing $(1, \infty)$

1) $y = -x^3 + 2x^2 + 2$

Decreasing $(-\infty, 0)$
increasing $(0, 1.33)$
decreasing $(1.33, \infty)$

2) $y = x^3 - 11x^2 + 39x - 47$

increasing $(-\infty, 3)$
decreasing $(3, 4.33)$
increasing $(4.33, \infty)$

3) $y = -x^4 + 3x^2 - 3$
increasing $(-\infty, -1.225)$
decreasing $(-1.225, 0)$
increasing $(0, 1.225)$
decreasing $(1.225, \infty)$

Practice: Use DESMOS to graph each function. After graphing use DESMOS to determine the coordinates of any relative maxima/minima

31. $f(x) = x^2 - 6x$

min: $(3, -9)$

32. $f(x) = 3x^2 - 2x - 5$

min: $(.33, -5.33)$

33. $y = 2x^3 + 3x^2 - 12x$

max: $(-2, 20)$
min: $(1, -7)$

34. $y = x^3 - 6x^2 + 15$

max: $(0, 15)$
min $(4, -17)$

35. $h(x) = (x-1)\sqrt{x}$

min $(.33, -.38)$
 $(0, 0)$ not a min

36. $g(x) = x\sqrt{4-x}$

max $(2.67, 3.08)$

37. $f(x) = x^2 - 4x - 5$

min $(2, -9)$

38. $f(x) = 3x^2 - 12x$

min $(2, -12)$

39. $f(x) = x^3 - 3x$

max $(-1, 2)$
min $(1, -2)$