

Ch 6: Graphs & Multipart Functions

Goal: Learn graph terminology and get comfortable with multipart functions.

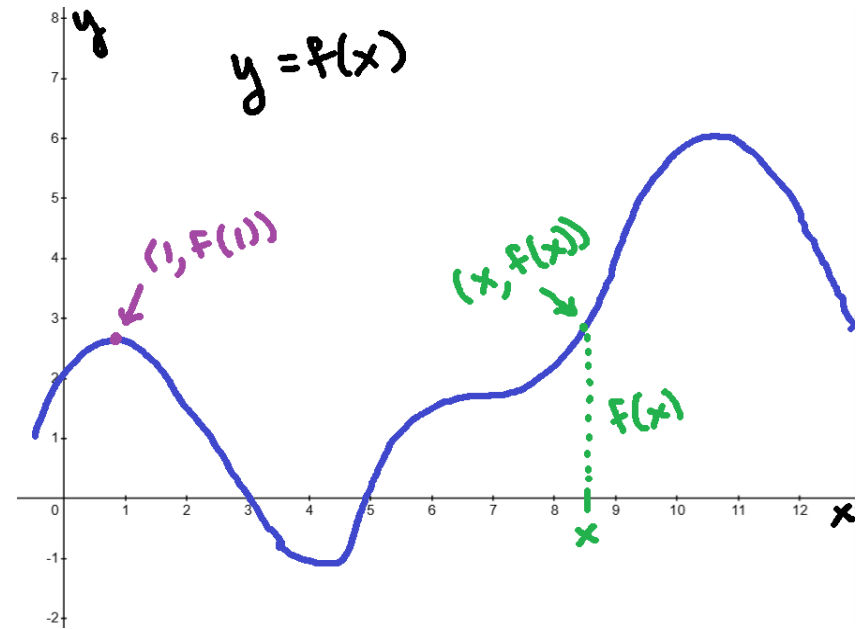
Let $f(x)$ = "height above (or below) the x axis in the given graph"

$(x, f(x))$ = "the point on the graph at x"

Entry Task:

(a) Roughly estimate $f(1)$

(b) Roughly estimate all solutions to $f(x) = 5$.



(c) Give all roots of the function.

(d) Describe all values of x when the function is negative.

The function (and graph) is said to be...
...**positive** if it is above the x-axis.

...**negative** if it is below the x-axis.

A value of x when the function is equal to zero is called a **zero** or a **root** of the function.

The function (and graph) is said to be...

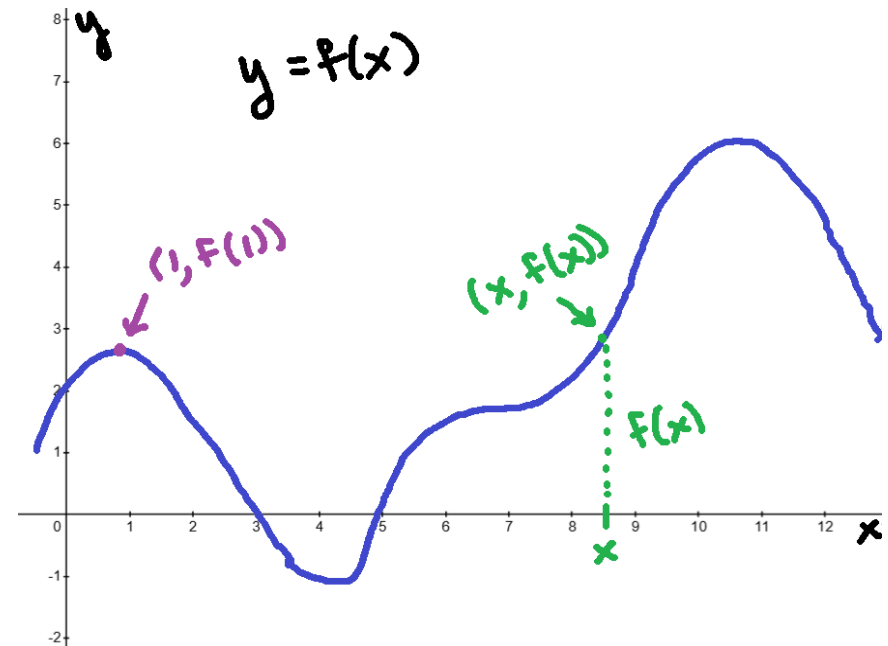
...**increasing** if it goes 'uphill from left to right'.

...**decreasing** if it goes 'downhill from left to right'.

In calculus we learn how to find and study the locations where function change between these!

More questions:

- (e) Describe all values of x when the function is increasing.
- (f) Describe all values of x when the function is decreasing.

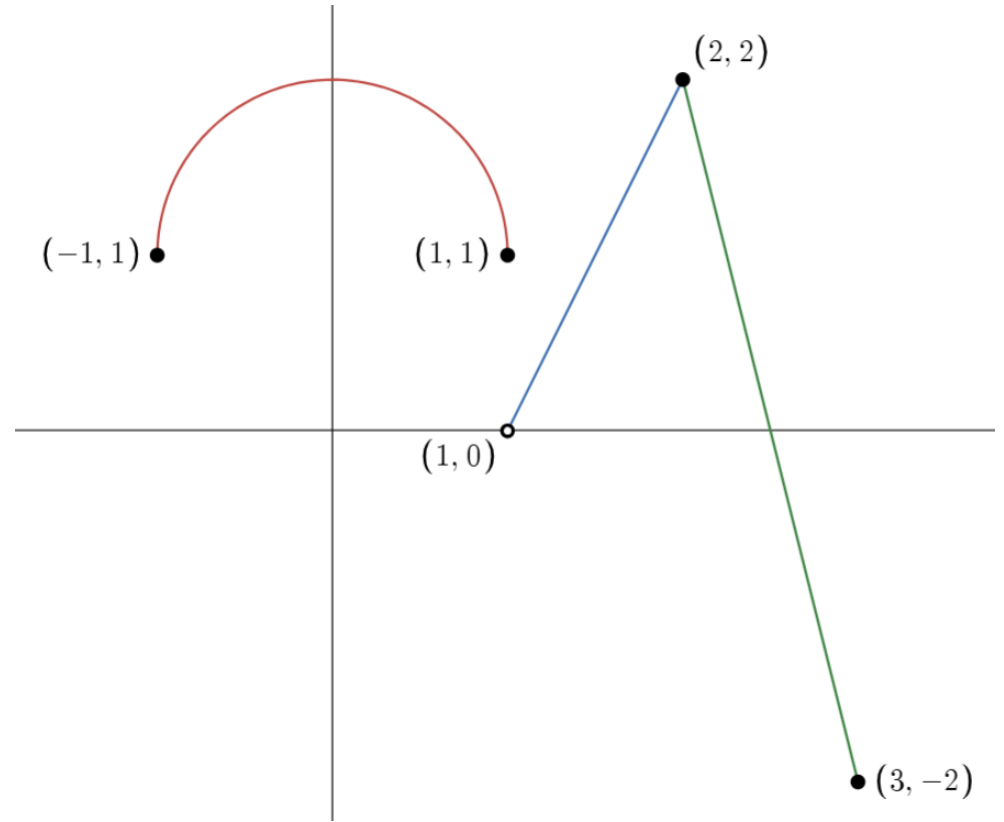


Multipart functions

In a problem, if a formula changes at some intermediate time, then the function that gives the value may be given by a ***multipart*** (or ***peicewise***) function and we write...

$$f(x) = \begin{cases} \text{Function 1} & , \text{if } ???; \\ \text{Function 2} & , \text{if } ???; \\ \text{Function 3} & , \text{if } ??? \end{cases}$$

Example: Write the multipart rules for the graph given which consists of an upper semicircle and two lines.



Absolute Values

Consider

$$|x| = \begin{cases} -x & , \text{if } x < 0; \\ x & , \text{if } x \geq 0. \end{cases}$$

Graph $y = x$ and graph $y = |x|$.

Graph $y = x + 3$ and graph $y = |x + 3|$, then give a multipart rule for this function.

Using Multi-part Functions

Key Notes:

- Split up your work
- Check domains!

Let's peek at some homework examples...

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(b) $f(x) = 4.5$ where $f(x) = \begin{cases} 3x & \text{if } x < 3, \\ 6 - x & \text{if } x \geq 3. \end{cases}$

$x =$

(c) $h(x) = -5$ where $h(x) = \begin{cases} -10 - 5x & \text{if } x \leq -2, \\ 1 + \frac{1}{3}x & \text{if } x > -2. \end{cases}$

$x =$

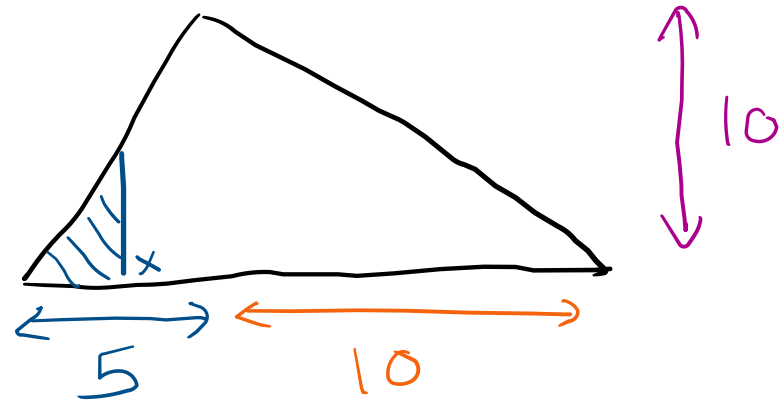
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(c) Let $h(x) = |x| - 3x + 4$. Find all solutions to the equation $h(x - 1) = x - 2$.

$x =$

Applied Multipart Problems (*putting it all together*)

Example: A triangular piece of cake is shown. You make a vertical cut x units from the left.



(a) Give a multipart function for the height of the cut as a function of x .

(b) Give the function for the area of the shaded region as a function of x for $0 \leq x \leq 5$.

(c) Give the function for the area of the shaded region as a function of x for $5 \leq x \leq 15$.

(d) Where would you make the cut if you wanted to cut piece in half?