Using Technology to Solve Problems

Go to
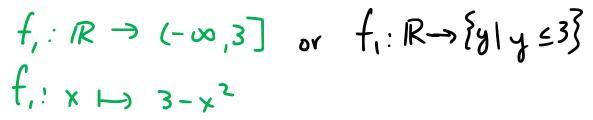- desmos.com/calculator

Consider the function:

$$f_1(x) = 3 - x^2$$

Type the function exactly as it's written into Desmos. To add a subscript, use the underscore key "f_1", to write a square press the carrot key "$x\string^2$".

Based on the graph state the domain set and the range set and write the function using mapping notation.

$$f_1 : \mathbb{R} \rightarrow (-\infty, 3] \quad \text{or} \quad f_1 : \mathbb{R} \rightarrow \{y \mid y \leq 3\}$$

$$f_1 : x \mapsto 3 - x^2$$

Now that the function is named, we can evaluate points by simply typing $f_1(\#)$ at the number we want to evaluate. Compute the following: Note that π is typed "pi", the square root is typed "sqrt" and the cube root is typed "cbrt"

$$f_1(-10) = -97$$

$$f_1(\pi) = -6.869\ldots$$

$$f_1\left(-\frac{1}{\sqrt{2}}\right) = 2.5$$

$$f_1\left(\sqrt[3]{\frac{4}{9}} + \sqrt{2}\right) = 1.488\ldots$$

We can solve for points in the range too just by graphing the horizontal line and finding the intersection points.
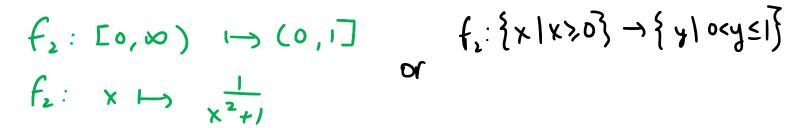
Solve for x if

$$f_1(x) = -10$$

$$x = \pm 3.606$$

$$f_1(x) = \frac{1}{\pi}$$

$$x = \pm 1.638$$

$$f_1(x) = 3$$

$$x = 0$$

$$f_1(x) = \pi$$

no solution since

$\pi \notin (-\infty, 3]$

(π is not in the range)

Now consider the function

$$f_2(x) = \frac{1}{x^2 + 1}, x \geq 0$$

Type this into Desmos but to restrict the domain instead of writing a comma, use curly brackets and then the inequality. $\{x >= 0\}$ is what you should type

Based on the graph state the domain set and the range set and write the function using mapping notation.

$$f_2 : [0, \infty) \longmapsto (0, 1]$$

$$f_2 : x \longmapsto \frac{1}{x^2+1}$$

or

$$f_2 : \{x \mid x \geq 0\} \rightarrow \{y \mid 0 < y \leq 1\}$$

As before, we can evaluate the function at some points:

$$f_2(0) = 1$$

$$f_2(\pi) = 0.091\ldots$$

$$f_2(-2) = \text{undefined}$$

$$-2 \notin [0, \infty)$$

$$f_2(a) = \frac{1}{a^2+1}$$

For the last one, it asks you to add a slider. Add one and describe what happens?

Click the endpoints of the slider so that a is in the domain of f_2 and change the step size to 0.1 .

Now we want to add the point $(a, f_2(a))$ on the graph. Type the coordinate as it's written and a point will appear that you can drag along the curve

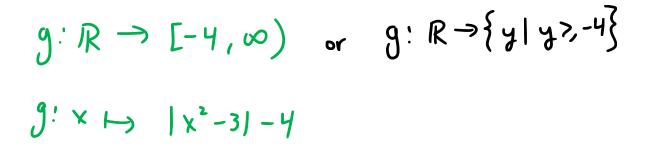**** To share your work, click the share button at the top and copy the link!**

Go to
- geogebra.org/graphing

Consider the function

$$g(x) = |x^2 - 3| - 4$$

Type the function exactly as it's written into Geogebra. To write an absolute value you can type "abs(...)" or use the vertical line button above the backslash.

Based on the graph state the domain set and the range set and write the function using mapping notation.

$$g : \mathbb{R} \to [-4, \infty) \quad \text{or} \quad g : \mathbb{R} \to \{y \mid y \geq -4\}$$

$$g : x \mapsto |x^2 - 3| - 4$$

Use Geogebra to evaluate the function at certain points

$g(2) = -3$

$g(\pi) = 2.869\ldots$

$g(-\sqrt{2}) = -3$

$g(\sqrt[4]{12}) = -3.535\ldots$

$g(a) = 2$

$g(A)$
↳ slider

Why is there no slider option for a but there is for A?

Because geogebra defined $g(2)$ as "a"

so $g(a)$ is really $g(-3)$

Adjust the limits of the slider A and then add the point $(A, g(A))$

Consider the function

$$h(x) = \begin{cases} (x+1)^2, & x < 1 \\ -x+3, & 2 < x \le 6 \end{cases}$$

To type the restrictions into Geogebra we can type in the logic of the function.
- If $x < 1$, then it's $(x+1)^2$
- If $2 < x \le 6$, then it's $-x+3$

Geogebra is great for this as it has a built in "if" function. Type "if(first inequality, first output, second inequality, second output)"

Based on the graph state the domain set and the range set and write the function using mapping notation.

$h: (-\infty, 1)$ or $(2, 6] \rightarrow [-3, \infty)$

or $\quad h: \{x \mid x < 1 \text{ or } 2 < x \le 6\} \rightarrow \{y \mid y \ge -3\}$

$h: \quad x \mapsto (x+1)^2, \quad x < 1$

$\qquad x \mapsto 3-x, \quad 2 < x \le 6$

Use Geogebra to evaluate some points and solve for x when asked.

$h(-30) = 841$ 　　　　　　　$h(1)$ undefined

$h(2)$ undefined 　　　　　　$h(\pi) = -0.141\dots$

$h(6) = -3$ 　　　　　　　　$h(10)$ undefined

$h(x) = 5 \implies x = -3.236\dots$ 　　$h(x) = 1 \implies x = -2, 0$

$h(x) = 0 \implies x = -1, 3$ 　　　$h(x) = -\sqrt{2} \implies x = 4.414$

$h(x) = -\pi$ 　　　　　　　　$h(x) = 401$
↳ no solution 　　　　　　　$x = -21.025$

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