Functions 7a - Domains In Context

Standards: F-IF.5, N-Q.3

Learning Target:

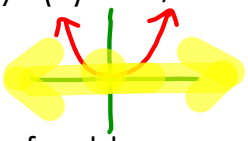
How do you identify a function's domain in context and from its graph?

HW#1: Func 7a #1-4

Oct 30-9:18 PM

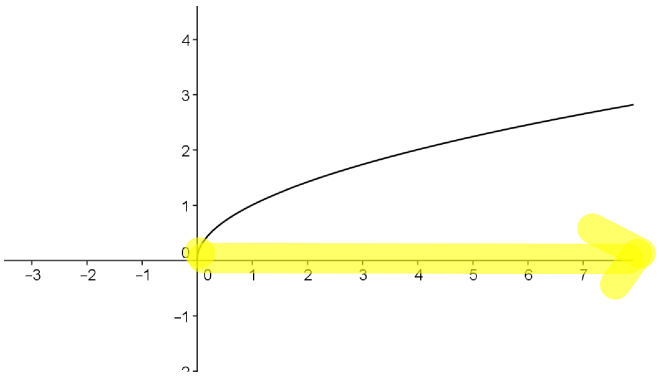
Recall that the ***Domain*** of a function is the function's ***set of inputs***

For example, for the function f defined by $f(x) = x^2$, the domain is the set of real numbers



Below are two examples of graphs that in fact have x-values excluded from their domains.

$$f(x) = \sqrt{x}$$



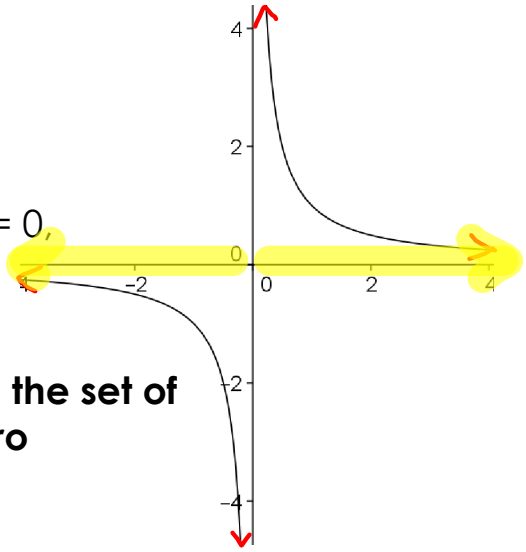
the domain for f is the set of nonnegative real numbers

$$Dom(f) = \{x : x \geq 0\}$$

Instead of using the term "nonnegative", why can't we simply state that the domain is the set of positive numbers?

$$f(x) = \frac{1}{x}$$

Since 1/x is not defined for x = 0, zero is not in the domain

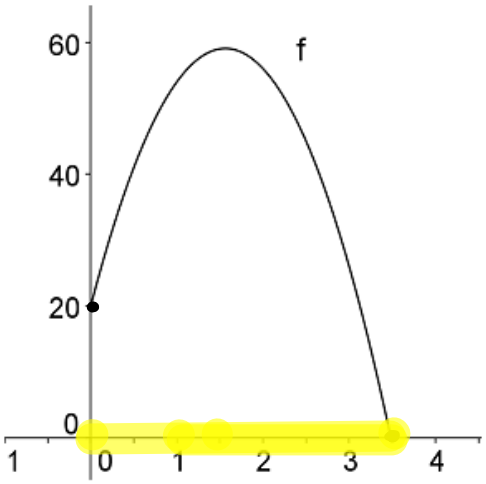


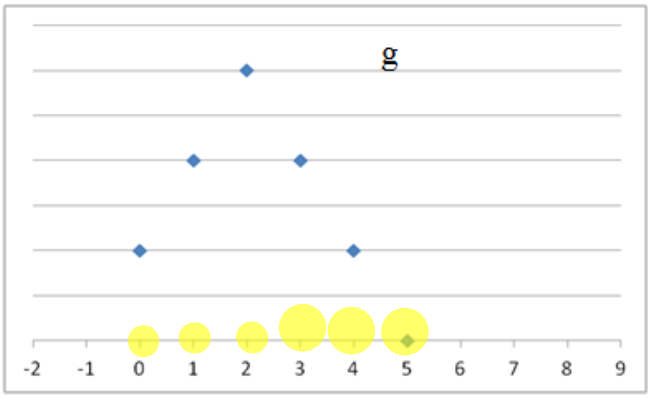
the domain for this function is the set of real numbers not equal to zero

$$Dom(f) = \{x : x \neq 0\}$$

Nov 20-10:13 PM

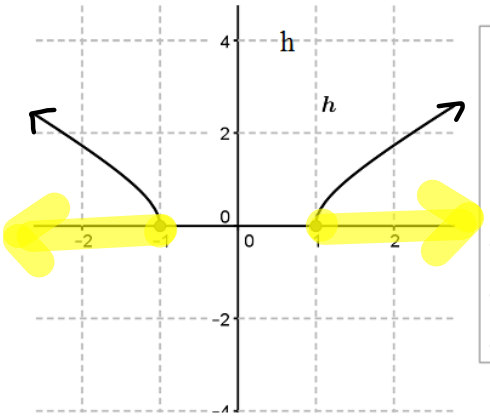
1. Identify the domain for each of the following functions. Provide your answer using both a complete sentence and in set notation. The graphs of f, g, and k are shown in their entirety, while the graph of h continues indefinitely to the left and to the right.

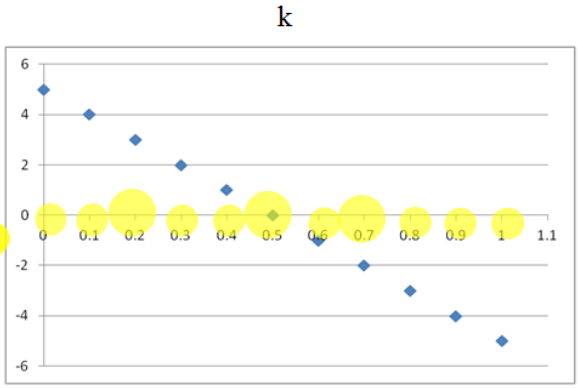




Dom(f) = All real numbers between & including 0 & 3.5.
$\{x : 0 \le x \le 3.5\}$ $[0, 3.5]$

Dom(g) = All whole numbers between & including 0 & 5.
$\{x : x = 0, 1, 2, 3, 4, 5\}$
$[0,0] \cup [1,1] \cup [2,2] \cup [3,3] \cup [4,4] \cup [5,5]$





Dom(h) = All real numbers less than or equal to -1 or greater than or equal to 1.
$\{x : x \le -1 \text{ or } x \ge 1\}$ $(-\infty, -1] \cup [1, \infty)$

Dom(k) = All multiples of 0.1 between & including 0 & 1.
$\{x : x = 0, 0.1, 0.2, \ldots, 1\}$

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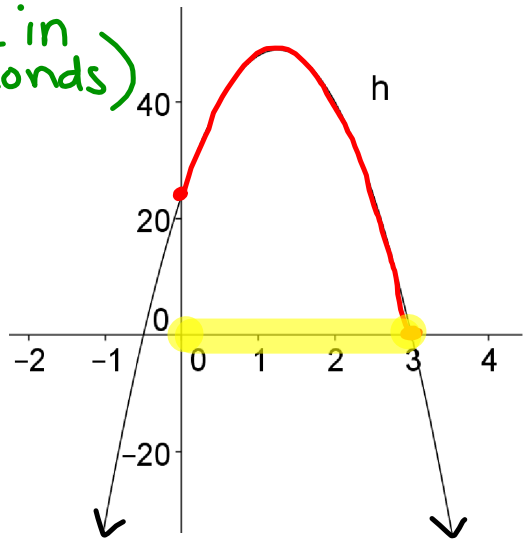
In this lesson we investigate how domain exclusions may exist based solely on the context of the problem. For example, if we pour water into a container and let h(t) represent the height of the water, in inches, t seconds after we begin pouring, then we would not be interested in the height of the water prior to our pouring, nor would we be interested in the height of the water after we quit pouring. This would restrict out domain to be $\{t : 0 \le t \le a\}$, where "a" represents the time we quit pouring.

Nov 20-10:27 PM

1. Sammy throws a rock as hard as he can from a bridge located 24 feet above a river, into the river below. The height, in ft., of the rock t seconds later is given by

$$h(t) = -16t^2 + 40t + 24$$

The graph of the symbolic form of h is shown below. Notice that the symbolic form of h is defined for all real numbers but that the context of the problem introduces domain restrictions. (t=time in seconds)



a. Find a single positive number *t* that is not in the contextual domain of *h* and explain why that number is excluded from the domain.

4, because the rock is already on the ground.

b. Find the domain of h in context. Write your response as a complete sentence and using set notation.

Dom(*h*) = All real numbers between & including 0 & 3.

$\{x : 0 \le x \le 3\}$

2. Every day in Austin, Texas, the USGS records the official high temperature for the day, as measured at its official site next to the airport

a. Explain why the temperature on the t^{th} day of the year 2017, T(t), is a function of the day of the year. Let t = 1 correspond to January 1, 2017. t = day of year

Every input (day of the year) has 1 output (high temperature).

b. Which of the following are in the domain for T? Explain your reasoning for each.

256 $3\frac{1}{2}$ 10/2 $\sqrt{81}$ 3^2 $\sqrt{29}$

5 9

c. Determine the domain for T in context. Write your response as a complete sentence and using set notation. Dom(*T*) =

All whole numbers between & including 1 & 365.

$\{x : x = 1, 2, 3, \ldots 365\}$

3. Hot Shot Supplies is looking to buy a shipment of pencils from Quik Fix, an office supply wholesaler. Hot Shot Supplies has enough room available in its storage facility to store as many as 500,000 pencils. Each pencil costs 5 cents. Let $C(p)$ represent the cost Hot Shot Supplies must pay Quik Fix for a shipment of p pencils. You may ignore any additional costs such as taxes and shipping.

a. Find a number between 10,000 and 10,001 that is NOT in the domain of C.

There is none.

b. Find the least positive integer that is NOT in the domain of C. (Recall that an "integer" is a counting number such as 1, 2, 3, …, along with 0 and the negative counting numbers.)

500,001

c. Determine the domain of C in context. Write your response as a complete sentence and using set notation.

Dom(C) = All whole numbers between & including 1 & 500,000.

$\{x : x = 1, 2, 3, \ldots, 500{,}000\}$

d. Suppose Hot Shot Supplies discovers that Quik Fix only sells their pencils in boxes of 1000. How does this change the domain of C?

Dom(C) = All multiples of 1000 between & including 1000 & 500,000.

$\{x : x = 1000, 2000, 3000, \ldots, 500{,}000\}$

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4. Solar World sells photovoltaic panels that generate electricity. They sell them for both commercial and residential use in Phoenix, AZ. Let *W(p)* represent the average monthly watts generated by *p* of their solar panels when installed in Phoenix. Note: Solar World sells panels in configurations ranging from a single panel to up to 1000 panels. (p = # of solar panels)

Find the domain for W in context.

Dom(W) = All whole numbers between including 1 & 1000.

$\{x : x = 1, 2, 3, \ldots, 1000\}$

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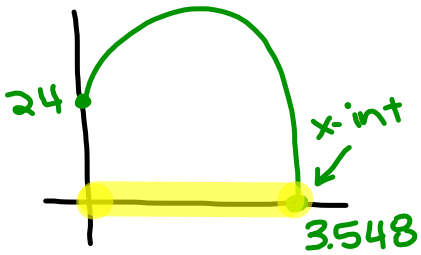
5. Let's return to the question involving Sammy throwing a rock off the bridge (problem 1 above). Suppose he throws a second rock, but with even more power, so that now the equation for the height of the rock t seconds after he releases it is given by

$$h(t) = -16t^2 + 50t + 24$$



$0 = -16t^2 + 50t + 24$

$$x = \frac{-(50) \pm \sqrt{(50)^2 - 4(-16)(24)}}{2(-16)}$$

$x = -0.423$ & 3.548

Determine the domain for *h* in this new context. Write your response as a complete sentence and using set notation. Dom(*h*) = All real numbers between & including 0 & 3.548.

$\{x : 0 \leq x \leq 3.548\}$