Lesson 4 Graphing in a Domain

November 14, 2018 3:51 PM

4) RELATIONS & FUNCTIONS: GRAPHING IN A DOMAIN

Table of value where x could be anything (x∈R)

In Lesson 2, when we graphed functions, we graphed in the domain of **all real numbers**.

Now, when you graph a relation, the domain may be:

1. Given as **R** (all real numbers) x = anything
2. Given as a list, for example: {-2, -1, 0, 1, 2} ← x = only these
3. Given as an inequality, for example: $\{x \geq 0\}$

> The domain that you are given just tells you what values of x you are allowed to plug into your table of values

↑ start with 0, 1, 2.... increase (no neg.)

Example #1: Graph the relation $y = 2x + 1$ in the following domains.

a) $\{x \mid x \in R\}$ — set notation; "x is such that x is all real #'s"; "is"

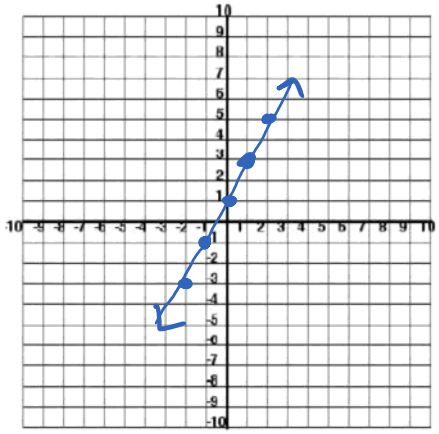
↳ means I can choose anything for x in the table of values (no restrictions)

because x∈R
- continuous (line)
- arrows on end (keep going)

y = 2x + 1

y = 2(-2) + 1
y = 2(-1) + 1
y = 2(0) + 1
y = 2(2) + 1
y = 2(1) + 1

x	y
-2	-3
-1	-1
0	1
2	5
1	3



b) $\{x \mid x = -4, -3, 0, 4\}$ — List. List = Discrete data

x only = -4, -3, 0, 4

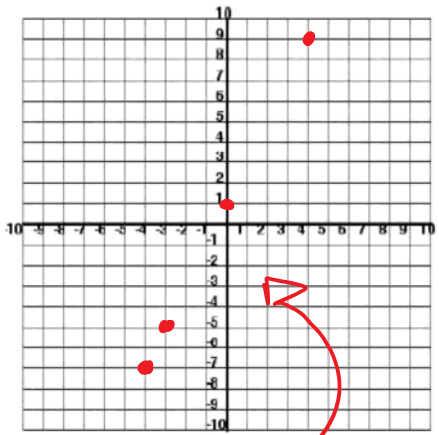
... nothing else

.... nothing between

y = 2x + 1

exact #'s

x	y	
-4	-7	y = 2(-4) + 1
-3	-5	y = 2(-3) + 1
0	1	y = 2(0) + 1
4	9	y = 2(4) + 1



NO LINE (discrete data)

Inequality

"x is such that x is less than -1, and x is a real number"

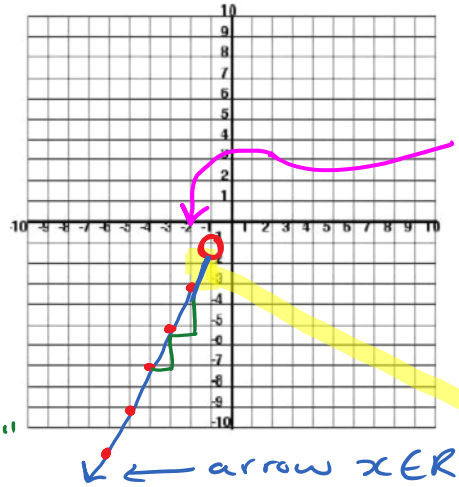
c) $\{x|x<-1, x\in R\}$

$y=2x+1$

$y=2(-2)+1$
$y=2(-3)+1$
$y=2(-4)+1$
$y=2(-5)+1$
$y=2(-6)+1$
$y=2(-1)+1$

x	y
-2	-3
-3	-5
-4	-7
-5	-9
-6	-11
-1	-1

"point of "open dot"



started @ x=-2 but the inequality is x<-1

need to show an open dot @ x=-1

shows that x can equal anything up to, but NOT including -1

arrow $x\in R$

Example #2: Find the domain and range of the following relations.

x y values

a) $y=2x-8$

$y=mx+b$ = Line = continuous data

Domain = $\{x|x\in R\}$

Range = $\{y|y\in R\}$

x	y
-2	
-1	
0	
1	
2	

-8

*b) $y=\sqrt{x+3}$

$x+3\geq 0$
$-3 \quad -3$

$x\geq -3$

Domain = $\{x|x\geq -3, x\in R\}$

Range = $\{y|y\geq 0, y\in R\}$

x	y
-4	err
-3	0
-2	1
-1	$\sqrt{2}$
0	$\sqrt{3}$

$y=\sqrt{-1+3}$
$y=\sqrt{0+3}$

-∞ +∞

c) $y=x^2-1$

always a "U" shape

Domain = $\{x|x\in R\}$

Range = $\{y|y\geq -1, y\in R\}$

x	y
-2	3
-1	0
0	-1
1	0
2	3

$y=(-2)^2-1$
$y=(-1)^2-1$
$y=(0)^2-1$
$y=(1)^2-1$
$y=(2)^2-1$

$y\geq -1$

Hint: Think about this in one of two ways:

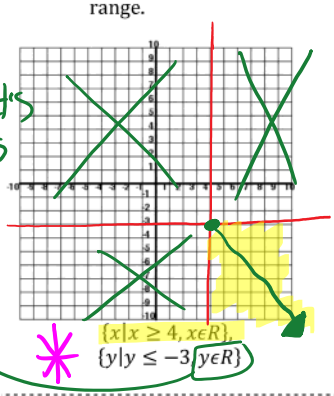
1. Visualize the graph
2. Consider if there are any x-values that you can't plug into the equation (ones that will give you an ERROR in your calculator)

Homework

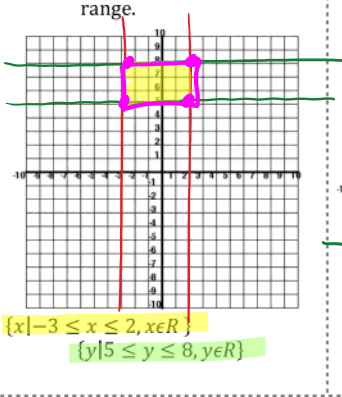
ASSIGNMENT # 4
Pages 20-24 Questions #67-90

You choose ... but follow the Rules

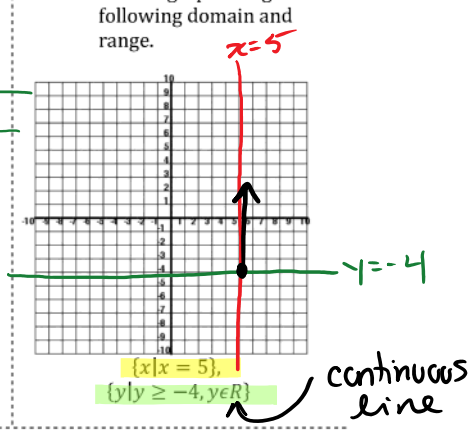
67. Draw a graph using the following domain and range.



68. Draw a graph using the following domain and range.

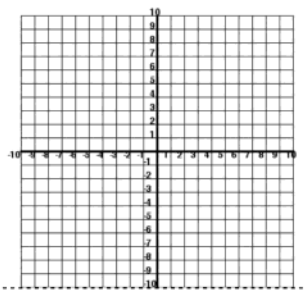


69. Draw a graph using the following domain and range.



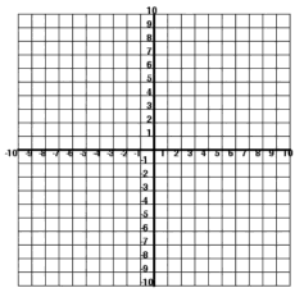
70. Challenge Question:
Graph the relation represented by the equation $y = 3x$.

71. What is the domain of $y = 3x$?



72. Challenge Question:

Graph the line represented by the equation $y = 3x$ if the domain is $x \geq -2$.



Graphing Relations and Domain:

When graphing a relation, the domain may be:

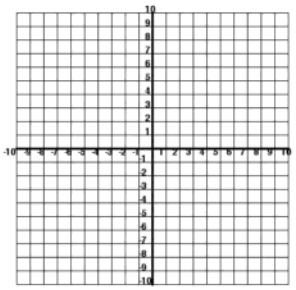
- Given as ***R*** (all real numbers)
- Given as a list such as {-2,-1,0,1,2}
- Given as an inequality such as $x \geq 0$.

When graphing equations earlier, we always assumed the domain was **all real numbers**. ..Not anymore.

We will consider the impact each of these have when graphing the relation $y = 2x$

73. Graph the relation $y = 2x$.

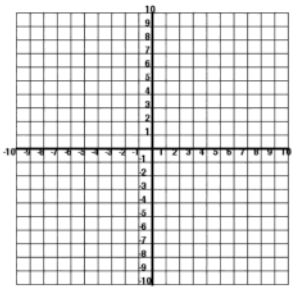
Domain:$\{x|x\epsilon R\}$



See next page for solution

74. Graph the relation $y = 2x$.

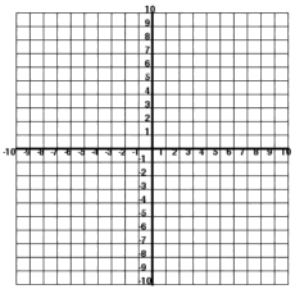
The domain is **{-2,-1,0,1,2}**



See next page for solution

75. Graph the relation $y = 2x$.

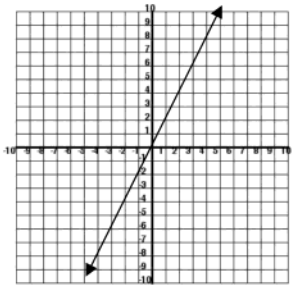
Domain: $(0, \infty)$



See next page for solution

Some notes here...

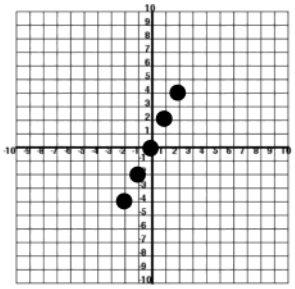
Graph the relation $y = 2x$.
The domain is $\{x|x\epsilon R\}$.



Any values of x would be permissible. This results in a continuous line in both directions.

Two arrow heads!

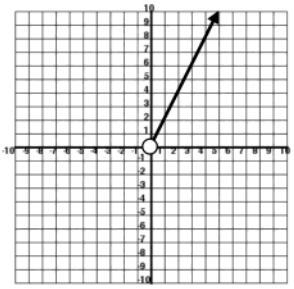
Graph the relation $y = 2x$.
The domain is **{-2,-1,0,1,2}**



Only the specified values of x would be permissible {-2,-1,0,1,2}. This results in five discrete points on the graph.

Find the y values that go with these five x values.

Graph the relation $y = 2x$.
Domain: $(0, \infty)$.

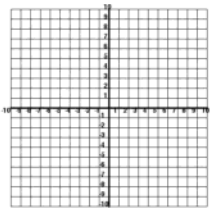


Any values of x greater than 0 would be permissible. This results in a continuous line starting at x=0 and moving in the positive direction.

One arrow head!

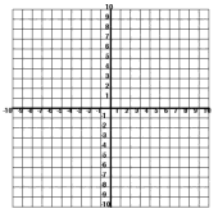
Graph each of the following for the given domain.

76. $y = 3x + 2$



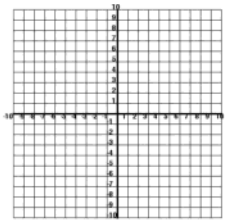
Domain: $\{x|x\epsilon R\}$

77. $y = -2x - 4$



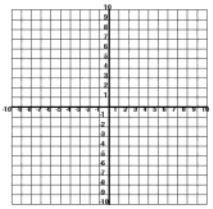
Domain is $\{-3, -1, 1, 3\}$.

78. $y = \frac{1}{2}x^2$



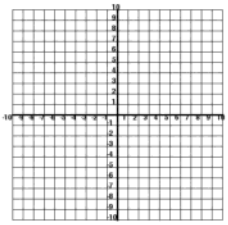
Domain is : $(\infty, 0)$

79. $y = x$



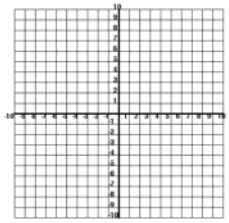
Domain is $\{x| -2 \leq x \leq 2,\ x\epsilon R\}$

80. $y = x^2 - 2$,



Domain is $\{-2, -1, 2, 1\}$.

81. $y - 5 = x + 2$,



Domain is $\{x|x\epsilon R\}$

82. In your own words, describe the different ways a relation may look due to restrictions on the domain.

Finding the domain and range of an equation.

Becoming more familiar with the equation of particular relations (assuming there is one) allows you to quickly determine the domain or range.

Possible Strategies:

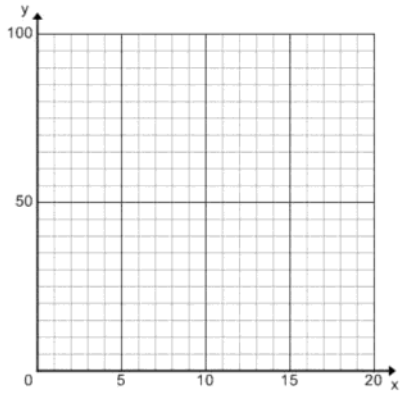
- Visualize the graph from memory (or actually plot it).
- Consider possible restrictions based on the equation. For example, $y = \sqrt{x}$ has a domain $x \geq 0$ because all negative values of x produce a "not real" output.

83. Find the domain of the relation: $y = 3x$	84. Find the domain of the relation: $y = \sqrt{x-2}$	85. Find the domain of the relation: $y = x^2$
86. Find the range of the relation: $y = 3x$	87. Find the range of the relation: $y = \sqrt{x-2}$	88. Find the range of the relation: $y = x^2$

89. Challenge Question:

Consider the various ways graphs look because of the restrictions on their domain before you answer the following question.

Use the equation $C = 10n$ to graph the cost, C, of a family with 'n' people to go to the movies.



90. Challenge Question:

Find a reasonable domain for the function above.

Find a reasonable range for the function above.

Some notes here…