DO NOW

Using the table of values, find the following:

x	-5	-3	0	2	8	9	20
f(x)	8	2	-1	9	4	4	0

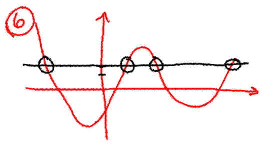
(1) f(-3) = 2

(2) f(8) = 4

(3) If f(x) = 9, what is x? x = 2

(4) If f(x) = 0, what is x? x = 20

(6)

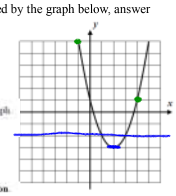


Jan 5-9:10 AM

Graphs of Functions

Graphs are on of the most powerful ways of visualizing a function's rule because you can quickly read **outputs** given **inputs**. You can also easily see features such as **maximum and minimum** output values. Let's review some of those skills in Exercise #1.

Exercise #1: Given the function y = f(x) defined by the graph below, answer the following questions.



(a) Find the value of each of the following:

$f(4) = 1$ $f(-1) = 6$

(b) For what values of x does $f(x) = -2$? Illustrate on the graph.

x = 1

x = 3

(c) State the **minimum** and **maximum** values of the function.

Maximum: highest value (y-value)

Minimum: lowest value (y-value)

$\boxed{\text{Max: } 6 \rightarrow y_{max} = 6 \quad \text{Min: } -3 \rightarrow y_{min} = -3}$

Jan 5-9:10 AM

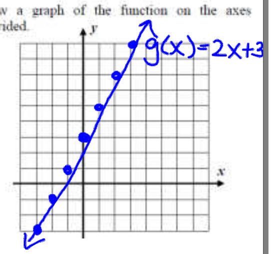
So, if we can read a graph to produce outputs (y- values) when we are given inputs (x- values), then we should be able to reverse the process and produce a graph of the function from its **algebraically expressed rule.**

Exercise #2: Consider the function given by the rule g(x) = 2x + 3.

(a) Fill out the table below for the inputs given.

x	$2x+3$	(x, y)
−3	2(-3)+3	(-3,-3)
−2	2(-2)+3	(-2,-1)
−1	2(-1)+3	(-1, 1)
0	2(0)+3	(0,3)
1	2(1)+3	(1,5)
2	2(2)+3	(2,7)
3	2(3)+3	(3,9)

(b) Draw a graph of the function on the axes provided.

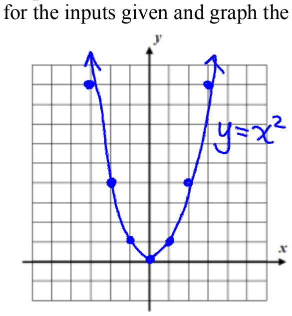


Jan 5-9:18 AM

Never forget that all we need to do to **translate** between an equation and a graph is to **plot** input/output pairs according to whatever rule we are given. Let's look at a simple **non- linear** function next.

Exercise #3: Consider the simplest **quadratic function** $f(x) = x^2$. Fill out the function table below for the inputs given and graph the function on the axes provided.

x	x^2	(x, y)
−3	$(-3)^2$	(-3,9)
−2	$(-2)^2$	(-2,4)
−1	$(-1)^2$	(-1,1)
0	$(0)^2$	(0,0)
1	$(1)^2$	(1,1)
2	$(2)^2$	(2,4)
3	$(3)^2$	(3,9)



Jan 5-9:21 AM

Sometimes the function's rule gets all sorts of funny and can include being **piecewise defined**. These functions have different rules for different values of x. These separate rules combine to make a larger (and more complicated rule). Let's try to get a feel for one of these.

Exercise #4: Consider the function given by the formula

$$f(x) = \begin{cases} 2x+6 & x < 0 \\ 6-x & x \geq 0 \end{cases}.$$

(a) Evaluate each of the following:

f(x) = 6 - x

$f(4) = 6 - 4$

$\boxed{f(4) = 2}$

f(x) = 2x + 6

$f(-3) = 2(-3) + 6$

$\boxed{f(-3) = 0}$

Jan 5-9:29 AM

Exercise #4: Consider the function given by the formula

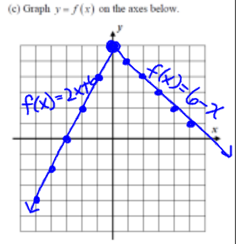
$$f(x) = \begin{cases} 2x+6 & x < 0 \\ 6-x & x \geq 0 \end{cases}.$$

(b) Fill out the table below for the inputs given. Keep in mind which formula you are using.

x	Rule 2x+6	(x,y)
-4	2(-4)+6	(-4,-2)
-3	2(-3)+6	(-3,0)
-2	2(-2)+6	(-2,2)
-1	2(-1)+6	(-1,4)
0	2(0)+6	(0,6)

x	Rule 6-x	(x,y)
0	6-0	(0,6)
1	6-1	(1,5)
2	6-2	(2,4)
3	6-3	(3,3)
4	6-4	(4,2)

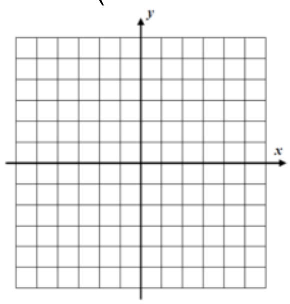
(c) Graph $y = f(x)$ on the axes below.



Jan 5-1:29 PM

Graph the piecewise function. (Use a table of values!)

$$f(x)=\begin{cases} x+5 & x<-2 \\ -2x-1 & x\geq -2 \end{cases}$$



Find: f(-8) f(6)

Jan 6-7:31 AM