Bell Ringer:

→ x; input

If $f(x) = \dfrac{\sqrt{2x+3}}{6x-5}$, then $f\left(\dfrac{1}{2}\right) =$

1) 1
2) -2
3) −1
4) $-\dfrac{13}{3}$

$\dfrac{\sqrt{2\left(\frac{1}{2}\right)+3}}{6\left(\frac{1}{2}\right)-5} = \dfrac{\sqrt{4}}{-2} = \dfrac{2}{-2} = -1$

$y = f(x)$ input

↓ output

→ rule

If $f(x) = kx^2$, and $f(2) = 12$, then k equals

1) 1
2) 2
3) 3
4) 4

$K(2)^2 = 12$

$K(2 \cdot 2) = 12$

$\dfrac{4K}{4} = \dfrac{12}{4}$ $K = 3$

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Which of the following are *not* input/output pairs for the function $f(n) = -2n + 3$?

~~[A] $f(3) = -3$~~ ~~[B] $f(5) = -7$~~

[C] $f(2) = 1$ ~~[D] $f(1) = 1$~~

$3^4 = 81$

Which function is greatest at $x = 4$?

[A] $f(x) = 3^x$ [B] $f(x) = 3 \cdot x^3$

$3 \cdot 4^3 = 192$

$4^3 = 64$

[C] $f(x) = x^3$

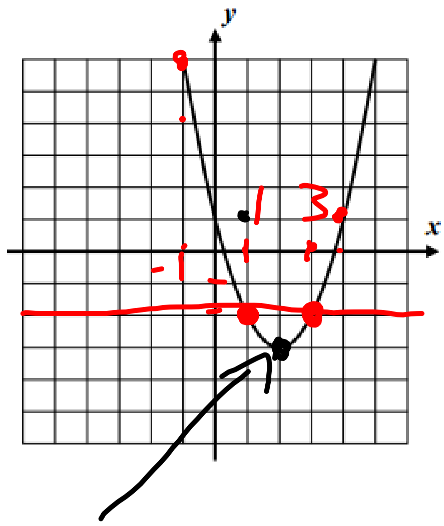
~~[D] none of the functions is greater than the others~~

Graphs are one 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:

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



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

1, 3

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

$f(2) = -4$

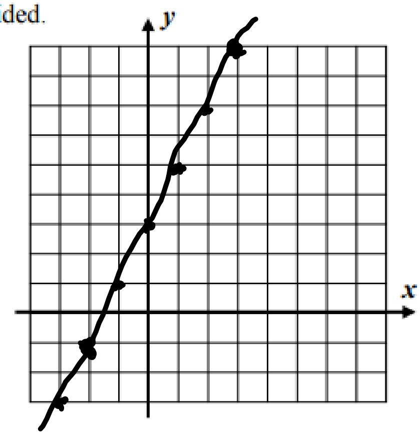
So, if we can read a graph to produce outputs (y-values) if we are given inputs (x-values), then we should be able to reverse the process and produce a graph of the function from its **algebraically expressed rule.**

***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		(-3, -3)
-2		(-2, -1)
-1		(-1, 1)
0		(0, 3)
1		(1, 5)
2		(2, 7)
3		(3, 9)

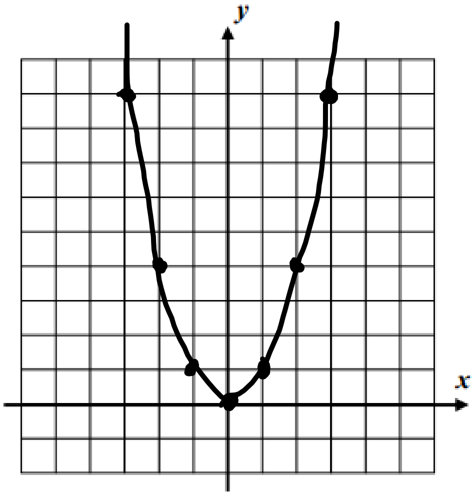
(b) Draw a graph of the function on the axes provided.



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	$(-3)^2=-3\cdot-3$	9
-2	$(-2)^2=-2\cdot-2$	4
-1	$-1\cdot-1$	1
0		0
1	$1\cdot1$	1
2	$2\cdot2$	4
3	$3\cdot3$	9



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 $f(x)=\begin{cases}2x+6 & x<0\\ 6-x & x\geq 0\end{cases}$. Your teacher will help you understand the notation of this function.

(a) Evaluate each of the following:

$f(4)=$ 2 $f(-3)=$ 0

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

x	Rule/Calculation	(x, y)
−3	2(-3)+6	0
−2	2(-2)+6	2
−1	2(-1)+6	4
0	6-0	6
1	6-1	5
2	6-2	4
3	6-3	3

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