Notes 1.2 Computations Involving Function Notation

The notation $f(x)$ is read "f of x." $f(x)$ is a notation of a function that represents y. In other words, $y = f(x)$.

Let's consider the function, $f(x) = -2(x+3)^2 + 4$. Find each of the following function values.

$f(-4)$ $= -2(-4+3)^2+4$
$= -2(-1)^2+4$
$= -2(1)+4$
$= -2+4$
$f(-4) = 2$

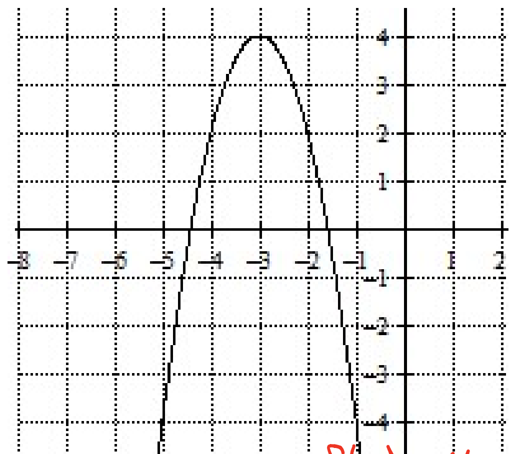
$f(-1)$ $= -2(-1+3)^2+4$
$= -2(2)^2+4$
$= -2(4)+4$
$= -8+4$
$= -4$

$f(0)$ $= -2(0+3)^2+4$
$= -2(3)^2+4$
$= -2(9)+4$
$= -18+4$
$= -14$

When you find the value of $f(-4)$, the value of $x = -4$. What does the result of $f(-4)$ represent graphically?

The result of $f(-4)$ represents the y-value on the graph of $f(x)$ when $x = -4$.

The graph $f(x) = -2(x+3)^2 + 4$ is pictured. Do the results of $f(-4)$ and $f(-1)$ calculated previously make sense in the context of the graph? Explain why or why not.



$f(-4) = 2$ and $f(-1) = -4$ make sense because on the graph of $f(x)$, when $x = -4$, $y = 2$ and when $x = -1$, $y = -4$

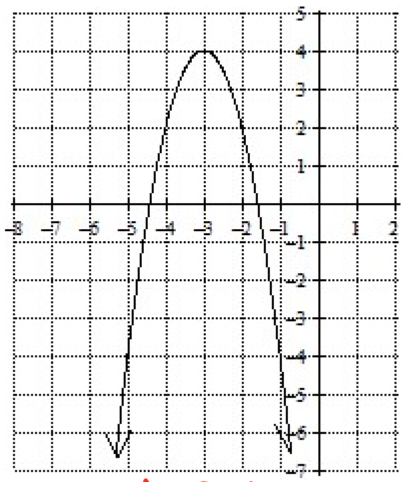
The graph of $f(x)$ has two zeros. Remember from Algebra II what a zero of a function is and define that term below.

A zero of a function is the x-value when $y = 0$. Graphically this means the function is crossing or is tangent to the x-axis.

The graph of $f(x)$ clearly crosses the x – axis at a value between $x = -4$ and $x = -1$. Based on your computations above, how could you justify the guarantee of this occurring at some value between $x = -4$ and $x = -1$?

Since $f(-4) = 2$, the graph of $f(x)$ is above the y-axis because $y > 0$. Since $f(-1) = -4$, the graph of $f(x)$ is below the y-axis because $y < 0$. $\therefore$ At some value of x between $x = -4$ and $x = -1$ the graph must cross the x-axis which guarantees a zero.

Based on the graph, we cannot determine exactly what the zeros of the function are. According to the graph, between what pairs of x – values do the zeros of the function lie?



According to the graph of f(x) a zero lies between x=-5 and x=-4 and another zero is between x=-2 and x=-1

Previously, we took the function $f(x) = -2(x+3)^2 + 4$ and found values of y by substituting in x – values. Now, suppose we set the equation $f(x) = a$ and solve for x.

When you solve the equation $f(x) = 0$, what do the results for x represent graphically? State the estimated value(s) of x.

The results of solving f(x)=0 represents the values of x when y=0.

$x \approx -4.5$

$x \approx -1.6$

When you solve the equation $f(x) = -4$, what do the results for x represent graphically? State the value(s) of x.

Solving f(x)=-4 represents the x-values when y=-4

For $f(x)$, solve each of the following equations.

$f(x) = 0$

$$-2(x+3)^2 + 4 = 0$$
$$-2(x+3)^2 = -4$$
$$(x+3)^2 = 2$$
$$x+3 = \pm\sqrt{2}$$
$$x = -3 \pm \sqrt{2}$$

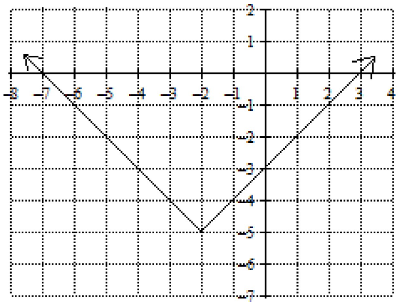
In summary, when you evaluate $f(a)$, what does the result represent graphically?

The results of f(a) represents the y-value when x=a

In summary, when you solve the equation $f(x) = a$, what do(es) the result(s) represent graphically?

The results of f(x)=a represents the x-value when y=a.

For each of the following functions, find the y–value given the x–value or find the x–value(s) given the y–value. Use the equation but verify your algebraic results using the given graph.



$g(x) = |x+2| - 5$

Find the value of $g(-6)$.

$g(-6) = |-6+2| - 5$
$= |-4| - 5$
$= 4 - 5$
$= -1$

For what value(s) of x does $g(x) = -4$?

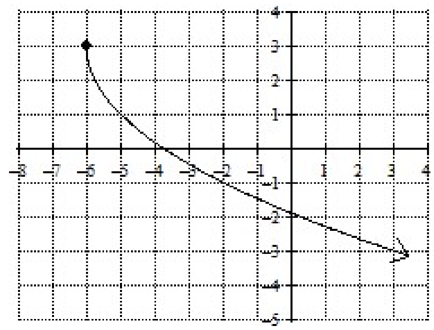
$-4 = |x+2| - 5$

$1 = |x+2|$

$\pm 1 = x+2$

$-2 \pm 1 = x$

$-3, -1 = x$



$h(x) = -2\sqrt{x+6} + 3$

Find the value of $h(-1)$.

$h(-1) = -2\sqrt{-1+6} + 3$
$= -2\sqrt{5} + 3$
≈ -1.472

For what value(s) of x does $h(x) = -3$?

$-3 = -2\sqrt{x+6} + 3$

$-6 = -2\sqrt{x+6}$

$(3)^2 = (\sqrt{x+6})^2$

$9 = x+6$

$3 = x$