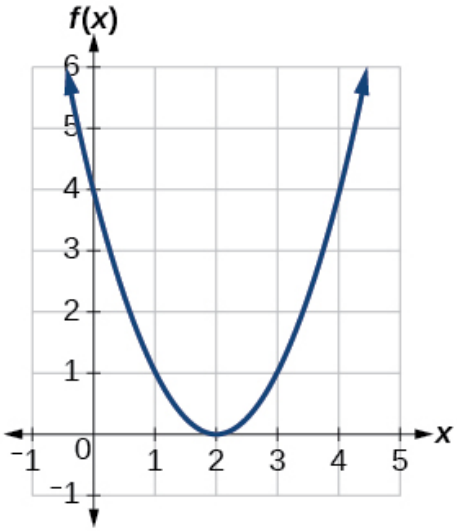
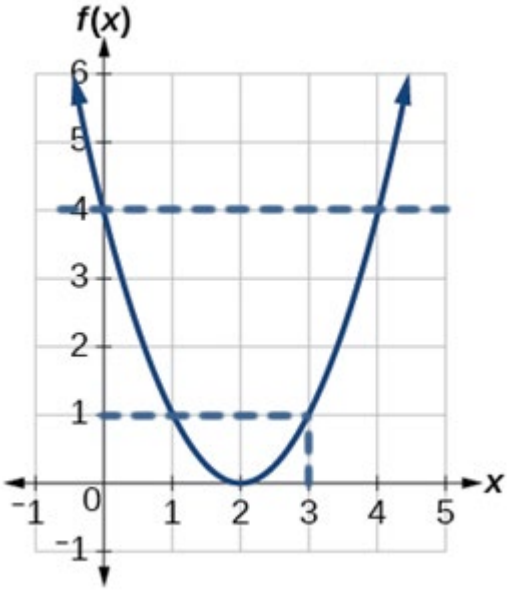
2.2 The Graph of a Function

Function notation and graphs

We will now apply function notation to graphs.

EXAMPLE: Given the graph below, evaluate . $f(3)$. Also, solve $f(x)=4$.

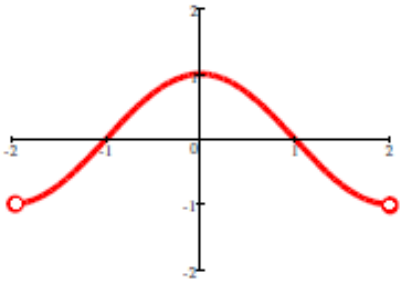




The expression $f(3)$ is asking for the *y*-value when *x* is 3. Since there is no equation to plug it into, you will read the value off of the graph. Go along the *x*-axis to 3 and then follow it up until it hits the graph. This occurs at the y value of 1. Therefore, $f(3)=1$.

To solve $f(x)=4$, this means you want to find all *x*-values that have a *y*-value of 4. Imagine a horizontal line that crosses the y-axis at 4. This would intersect our graph at 0 and 4. Therefore these are our values of *x* that would solve the equation.

EXAMPLE: Use the graph below to answer the following:

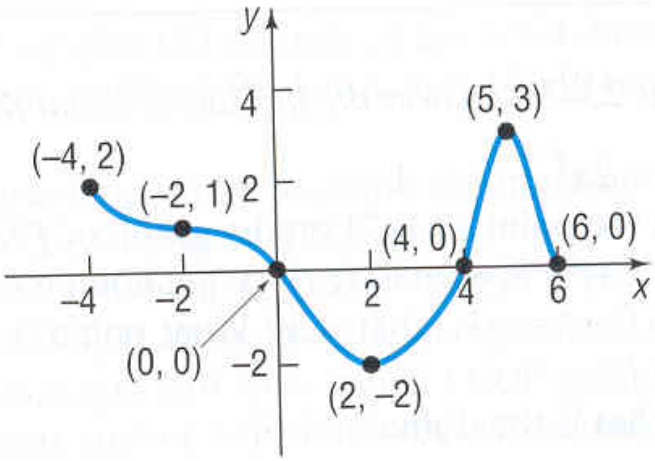


a.) Find the domain
Since we don't include the endpoints we have (-2, 2) (x values)

b.) Find the range
The answer is (-1, 1] (y-values)

c.) Indicate the intercepts
x-int: (-1, 0) (1, 0) y-int: (0, 1)

EXAMPLE: Use the graph below to answer the following:



a.) Find $f(-2)$:

This is asking you for the y value when x is -2.
The answer is $f(-2) = 1$.

b.) Find all x such that $f(x) = 3$

This is asking you to find all x that give a y value of 3. This happens at the point (5, 3), so x = 5.

c.) Is $f(3)$ positive or negative?

This is asking you if the y value at x = 3 is above or below the x axis. To find this go over to x = 3. We notice the graph is below the x-axis, so answer is neg.

d.) What is the domain?

This is asking you for all the x values the graph uses. This would be [-4, 6]. (lowest x to highest x)

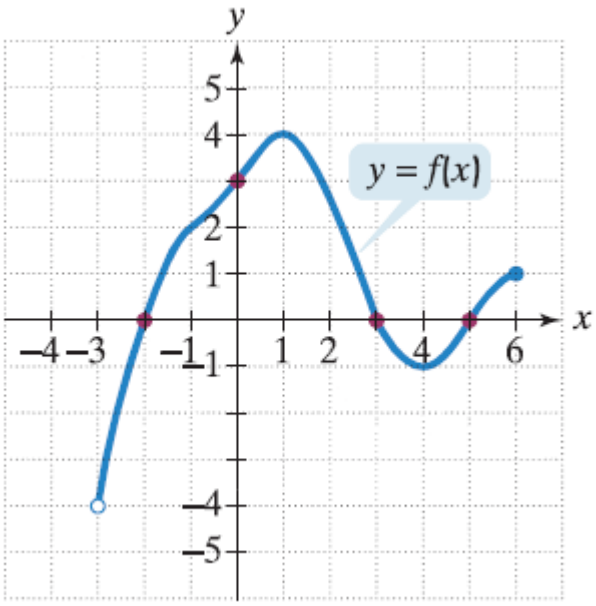
e.) What is the range?

This is asking you for all the y values the graph uses. The answer is [-2, 3]. (lowest y to highest y).

f.) For which values is $f(x) > 0$?

This is asking you which part of the graph has positive y values. In other words, what part of the graph is above the x-axis, but not on the x-axis. We have two places this occurs. [-4, 0) or (4, 6) Notice the values I gave in the interval notation are x values. We include the -4 because it is not on the x-axis.

EXAMPLE: Use the graph below to answer the following:



a.) Find $f(-1)$:
This is asking you for the y value when x is -1.
The answer is $f(-1) = 2$.
It does not matter if the x-value has a dot or not.

b.) Find all x such that $f(x) = 0$
This is asking you to find all x that give a y value of 0.
This happens at x = –2, 3, and 5 .

c.) Is $f\left(-\frac{3}{2}\right)$ positive or negative?
This fraction is the same as -1.5. When you go to this x value the graph is above the x-axis here, so positive.

d.) What is the domain?
The domain is referring to the x-values the graph uses. Since there is an open circle at –3 , this x-value is not included. So the domain is: (–3, 6].

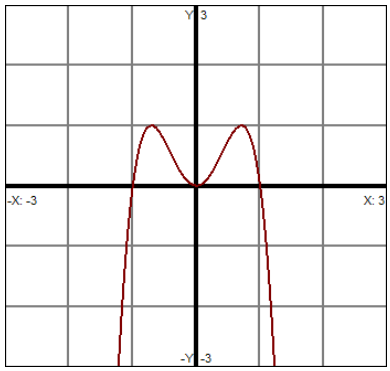
e.) What is the range?
The range is referring to the y-values the graph uses. Again since there is an open circle at –3 , this y-value is not included. So the range is (–4, 4].

f.) Indicate the x and y intercepts.
y-int: (0, 3) x-int: (-2, 0), (3, 0), (5, 0).

EXAMPLE: Determine whether the graph below is that of a function by using the vertical-line test. If it is, use the graph to find (a) the domain and range (b) the intercepts, if any (c) any symmetry with respect to the x-axis, y-axis, or the origin.

(a) The domain is all the x-values the graph uses.
It uses all x-values, so the domain is $(-\infty, \infty)$.

The range is the y-values. We see that the largest y-value used is 1.
The range is $(-\infty, 1]$.



(b) The x-intercepts are where the graph crosses or touches the x-axis.
The x-intercepts are (–1,0), (0,0) and (1,0). The y-intercept is (0,0).

(c) If the graph is folded along the y-axis it will lay on top of itself.
This means the graph has y-axis symmetry.