

This homework assignment helps you practice plotting functions. It is due by 12pm on Friday, February 18. You may turn it in in class on Friday morning or bring it to my office, LCB 317, by 12pm. Late assignments will not be accepted. We'll start out by looking at an example.

Consider the function

$$f(x) = \sqrt{x}$$

To plot this function, we want to do the same thing we do when graphing equations, we want to choose various inputs (x values) and calculate the corresponding outputs (y values). Remember the the graph of $f(x) = \sqrt{x}$ is the graph of $y = \sqrt{x}$. We can choose any input values in the domain (in this case the domain is $x \geq 0$) but it makes sense to choose input values that are easy to calculate. Here, it makes sense to choose inputs that are perfect squares because then it will be easy to take the square root. We should choose enough values to give us a general idea of what the function looks like.

We'll calculate the outputs for inputs of $x = 0, \frac{1}{4}, 1,$ and 4

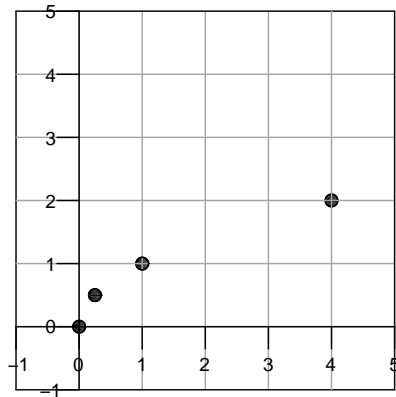
When $x = 0, y = f(x) = \sqrt{0} = 0$ so the point $(0, 0)$ is on the graph of $y = f(x) = \sqrt{x}$

When $x = \frac{1}{4}, y = \sqrt{\frac{1}{4}} = \frac{1}{2}$ so $(\frac{1}{4}, \frac{1}{2})$ is on the graph.

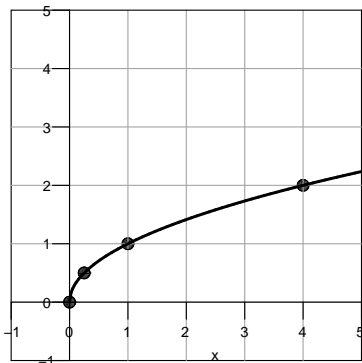
When $x = 1, y = \sqrt{1} = 1$ so $(1, 1)$ is on the graph.

When $x = 4, y = \sqrt{4} = 2$ so $(4, 2)$ is on the graph.

If we plot all of these points, it looks like the following:



If we connect the dots, we get a good representation of the function $f(x) = \sqrt{x}$



We can go through the same process for the function $f(x) = \sqrt{x+1}$. We should choose different input values though, because the function has a different domain, $x \geq -1$, and the values we chose last time will no longer yield perfect squares inside the square root.

We'll use the input values $x = -1, -3/4, 0$, and 3 .

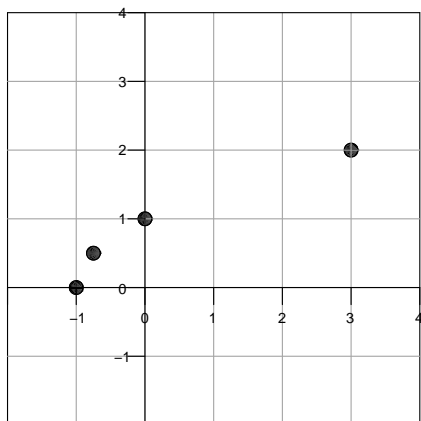
$$\text{When } x = -1, y = \sqrt{-1+1} = 0$$

$$\text{When } x = -\frac{3}{4}, y = \sqrt{-\frac{3}{4}+1} = \sqrt{\frac{1}{4}} = \frac{1}{2}$$

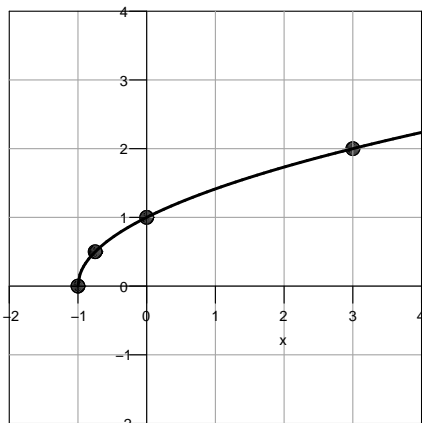
$$\text{When } x = 0, y = \sqrt{0+1} = 1$$

$$\text{When } x = 3, y = \sqrt{3+1} = 2$$

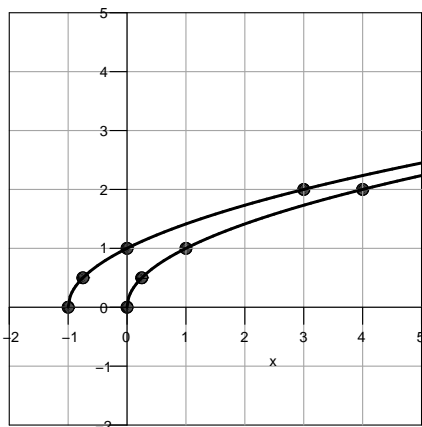
So we have the points $(-1, 0), (-\frac{3}{4}, \frac{1}{2}), (0, 1)$, and $(3, 2)$ which we can plot as follows:



Connecting the dots gives:



Finally, if we plot these two functions together on the same coordinate system, we get the following

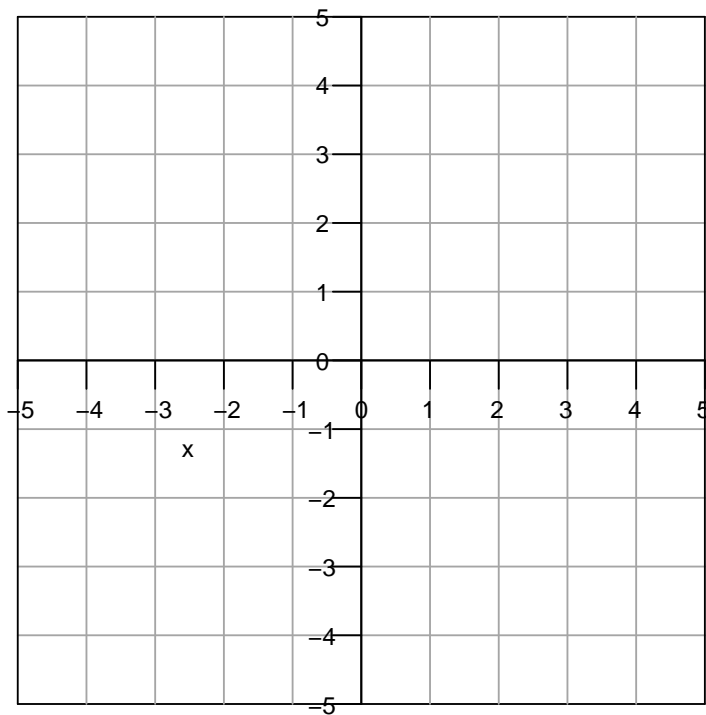


We can see that $g(x)$ looks just like $f(x)$ except that it is shifted one unit to the left. There are rules we can memorize for how graphs shift or reflect, and you should be familiar with these rules. Often though, you can get a good idea of the behavior of a shifted or reflected graph and remind yourself of the behavior by plotting a few points and comparing with the original graph. Practice this by completing the following problems.

1. Let $f(x) = \sqrt{x}$. Let $g(x) = \sqrt{-x} + 2$

(a) State the domain of $g(x)$.

(b) plot $f(x)$ and $g(x)$.

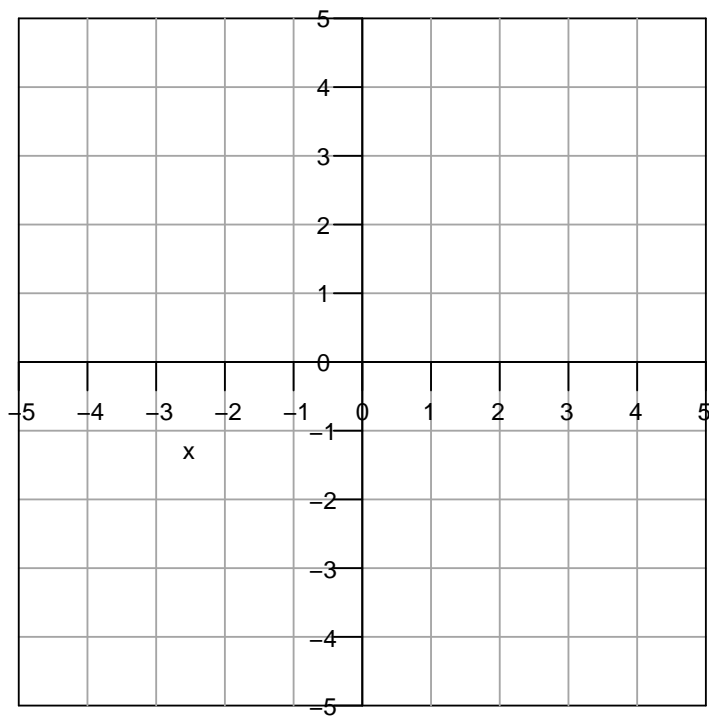


(c) Describe the relationship between $g(x)$ and $f(x)$.

2. Let $f(x) = x^2$. Let $g(x) = -(x + 2)^2 + 1$

(a) State the domain of $g(x)$.

(b) plot $f(x)$ and $g(x)$.

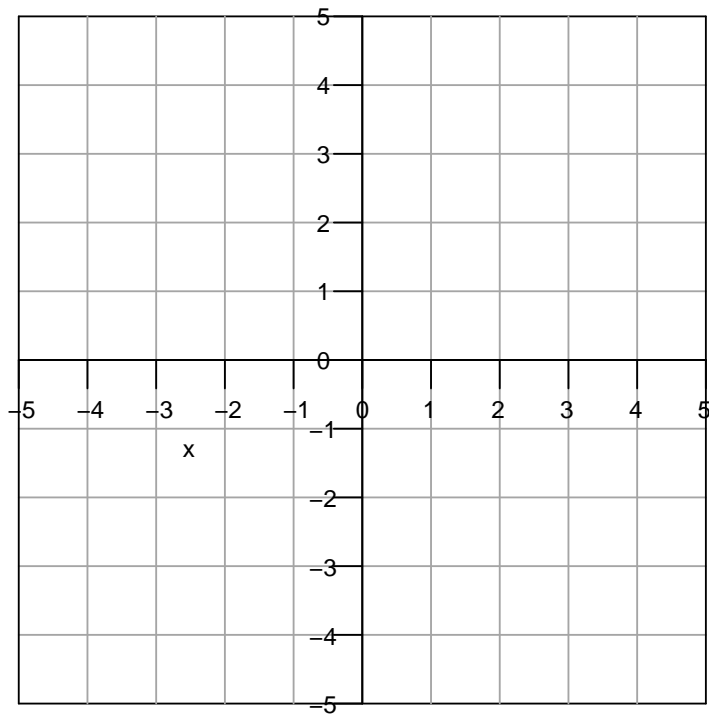


(c) Describe the relationship between $g(x)$ and $f(x)$.

3. Let $f(x) = |x|$. Let $g(x) = -|x + 1| - 1$

(a) State the domain of $g(x)$.

(b) plot $f(x)$ and $g(x)$.



(c) Describe the relationship between $g(x)$ and $f(x)$.