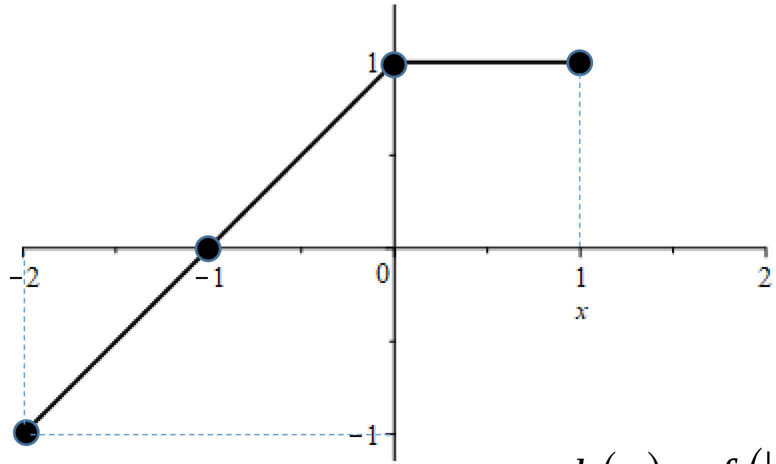
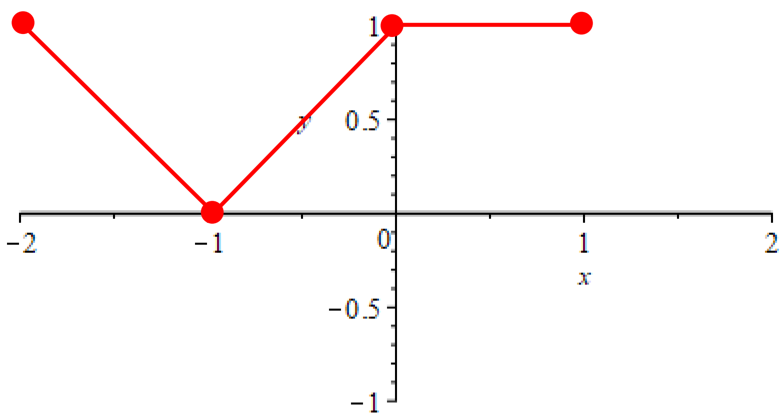
More Transformations:

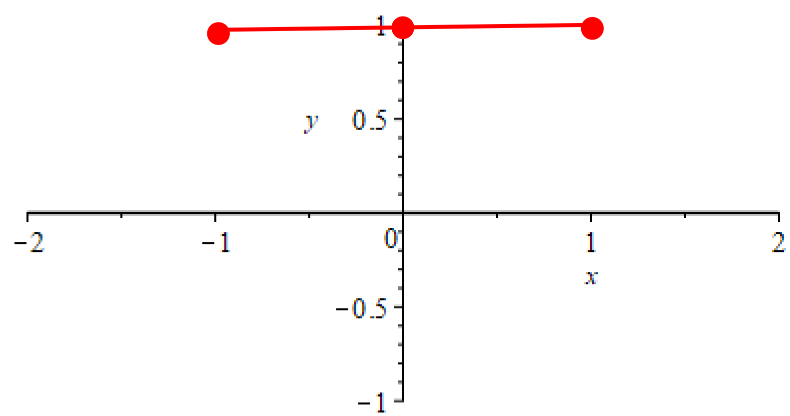
f



$g(x) = |f(x)|$

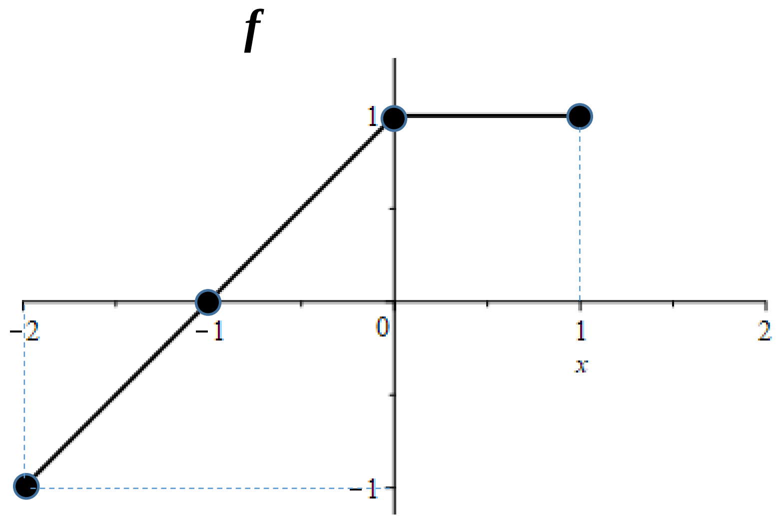
$h(x) = f(|x|)$



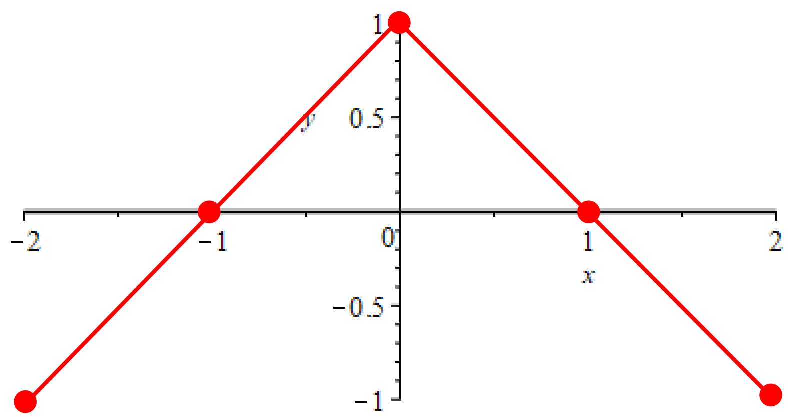


Points on or above the *x*-axis are unchanged, but points below are reflected above.

Points on or to the right of the *y*-axis are unchanged, but points to the left are reflections from the right.



$g(x) = f(-|x|)$

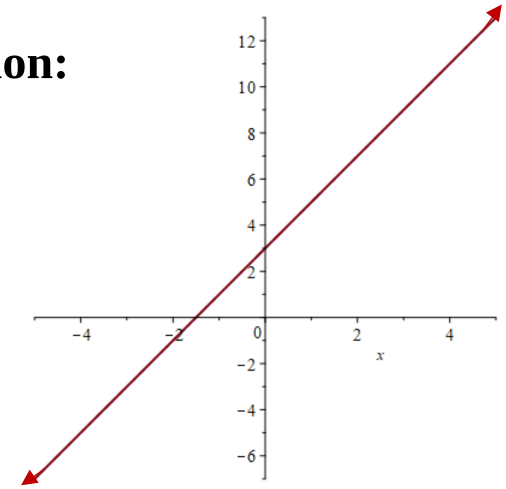


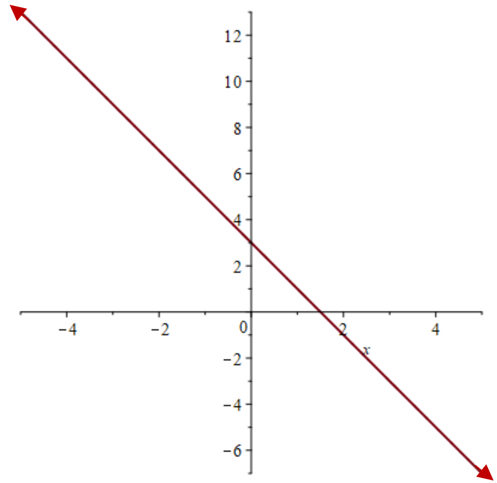
Points on or to the left of the *y*-axis are unchanged, but points to the right are reflections from the left.

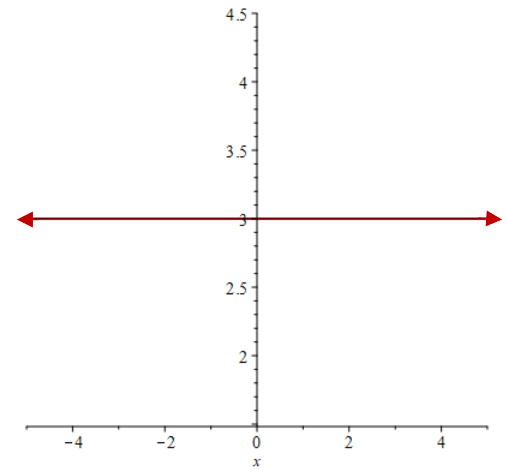
Library of Common Functions:

1. Linear Function:

$f(x) = mx + b$

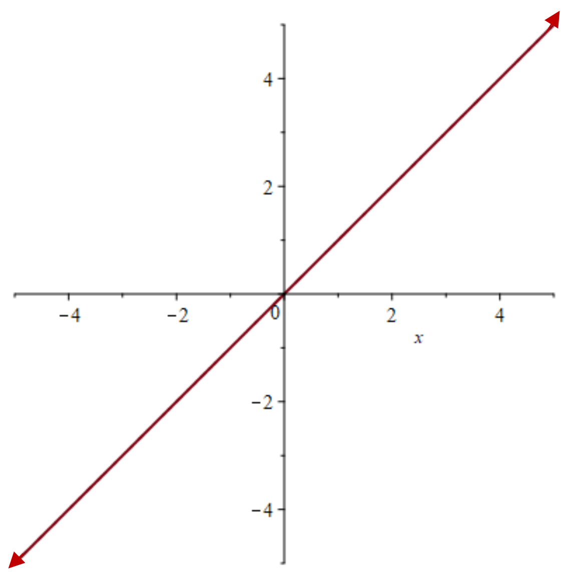






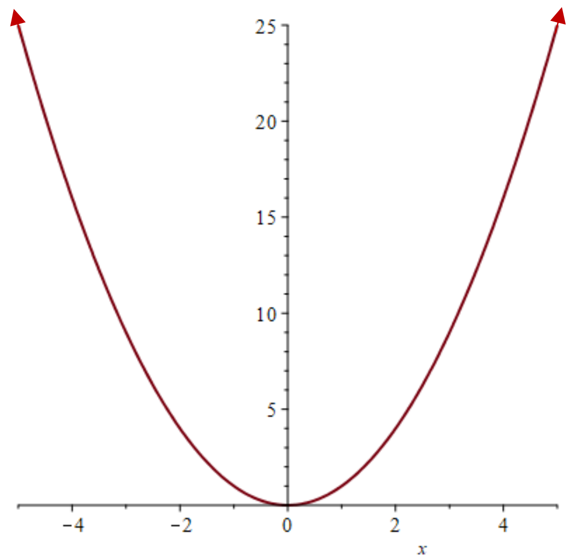
2. Identity Function:

$f(x) = x$



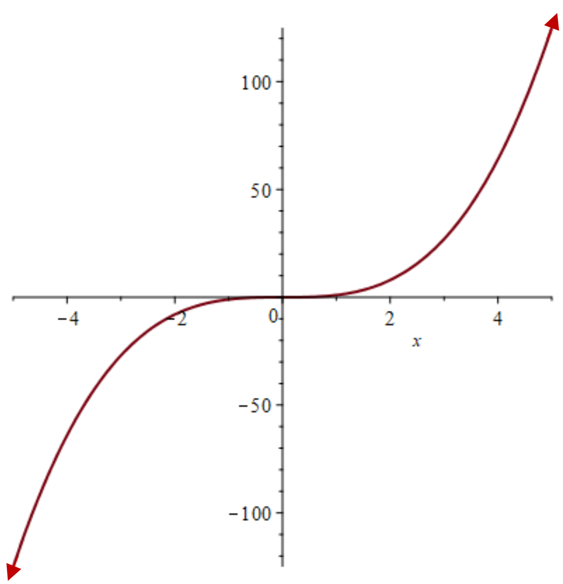
3. Squaring Function:

$f(x) = x^2$



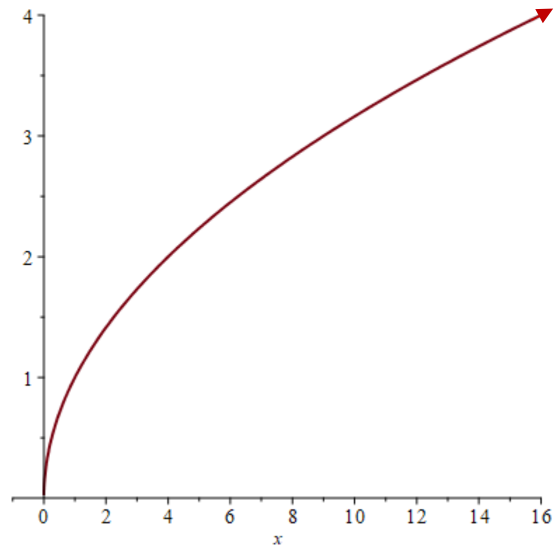
4. Cubing Function:

$f(x) = x^3$



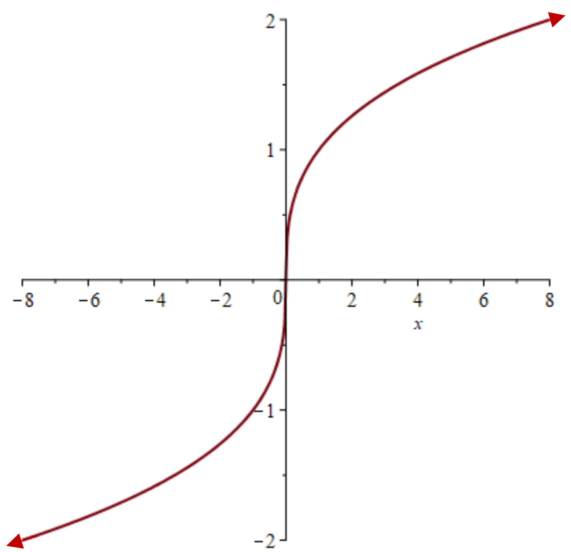
5. Square Root Function:

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



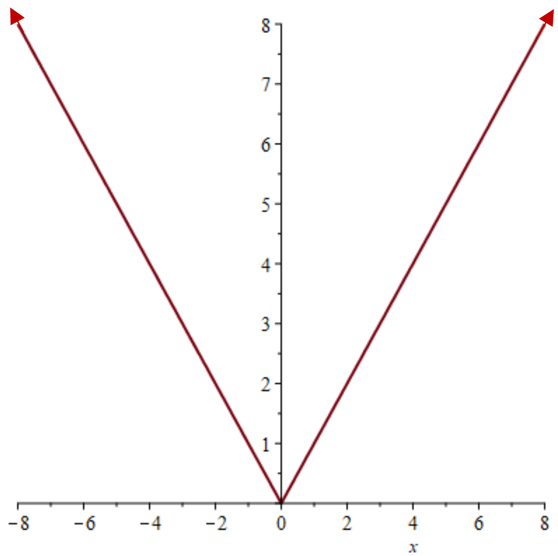
6. Cube Root Function:

$f(x) = \sqrt[3]{x}$



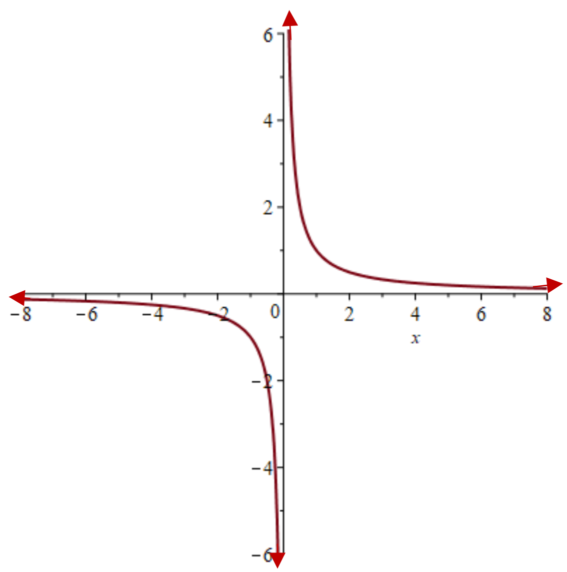
7. Absolute Value Function:

$f(x) = |x|$



8. Reciprocal Function:

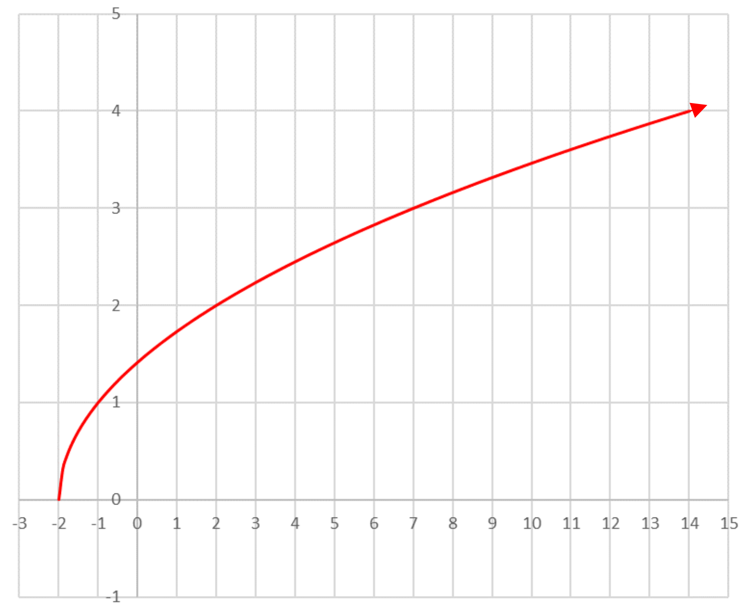
$f(x) = \dfrac{1}{x}$



Graph the following:

$f(x) = \sqrt{x+2}$

Shift the square-root graph 2 units to the left.



$f(x) = \sqrt{2-x} = \sqrt{-x+2}$ or $\sqrt{-(x-2)}$

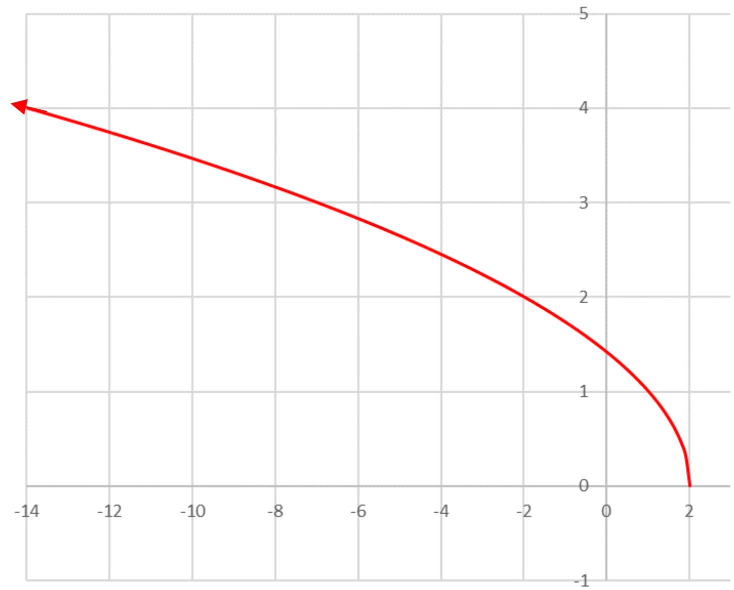
Shift the square-root graph 2 units to the left,

and reflect about the *y*-axis.

OR

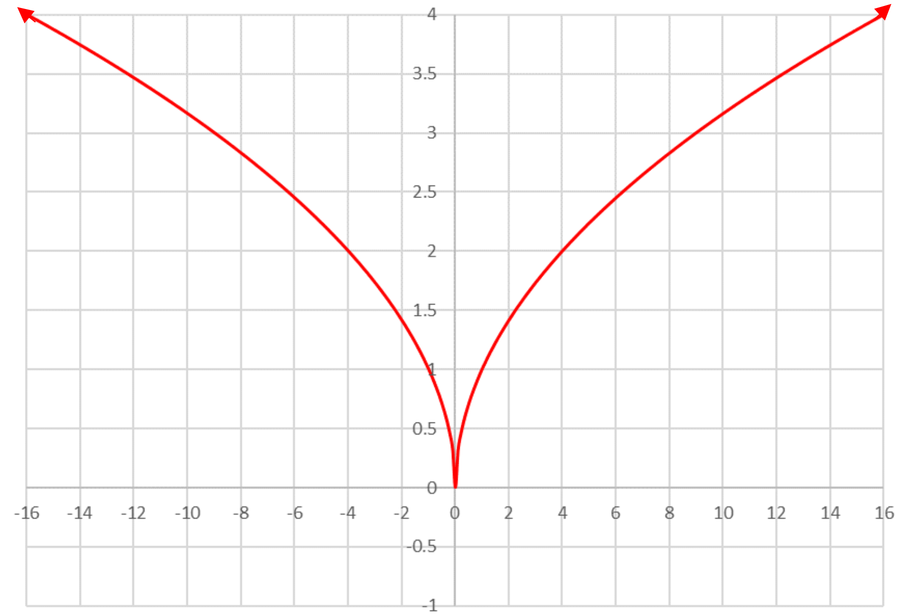
Reflect the square-root graph about the *y*-axis,

And shift it 2 units to the right.



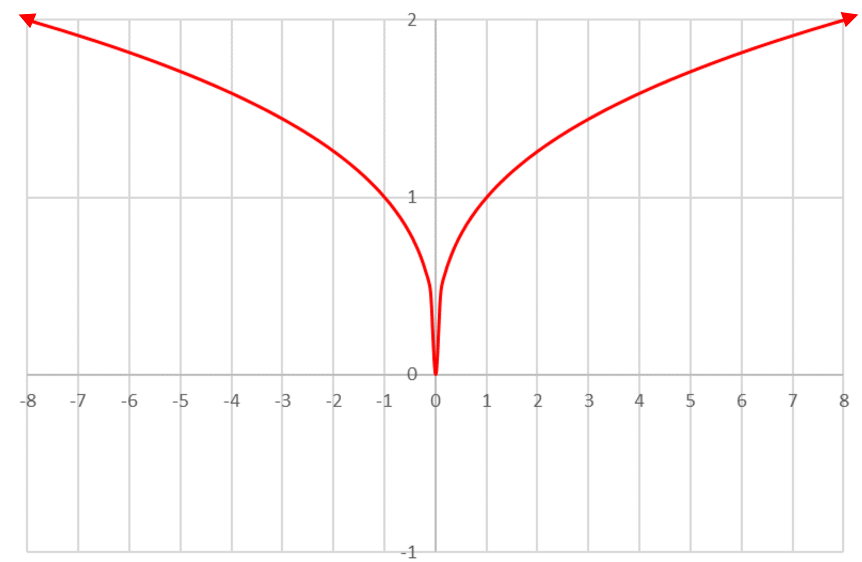
$$f(x)=\sqrt{|x|}$$

Leave the portion of the square-root graph on and to the right of the *y*-axis alone, but also reflect it to the left side.



$$f(x)=\left|\sqrt[3]{x}\right|$$

Leave the portion of the cube-root graph on and above the *x*-axis alone, and reflect the portion of the graph below the *x*-axis so that it's above the *x*-axis.

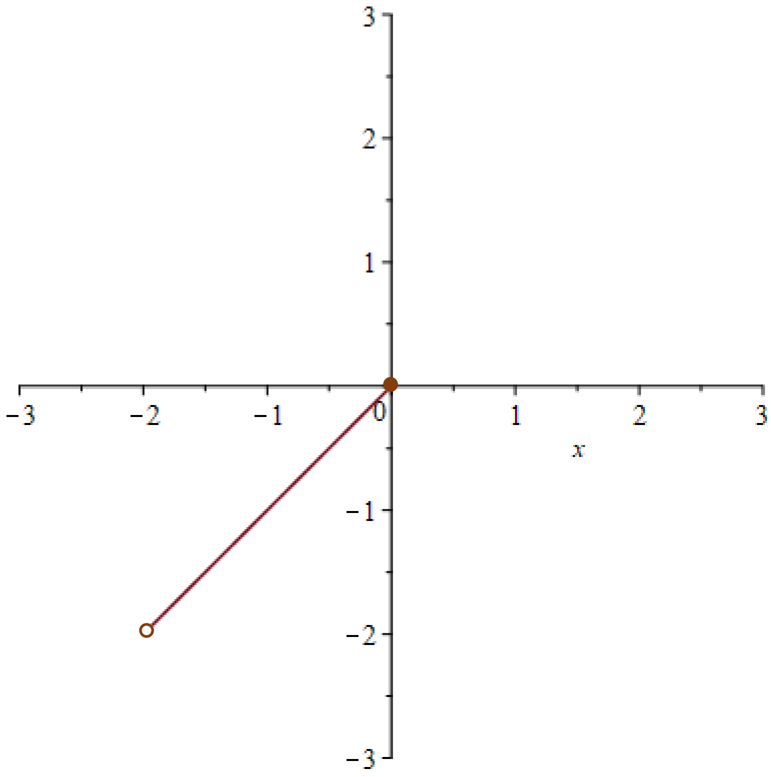


Graphing Piecewise-defined Functions Constructed from the Library Functions.

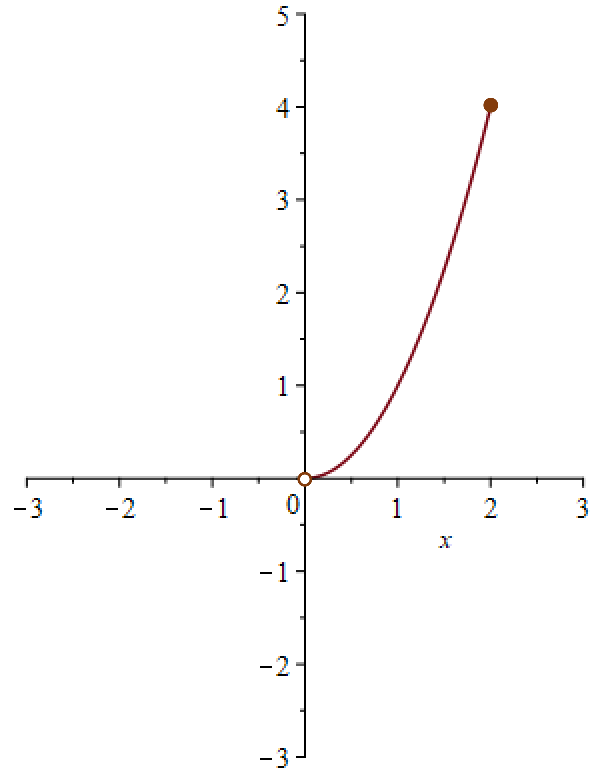
1. $f(x)=\begin{cases} x; -2 < x \le 0 \\ x^2; 0 < x \le 2 \end{cases}$

Graph the two formulas separately.

$x; -2 < x \le 0$



$x^2; 0 < x \le 2$

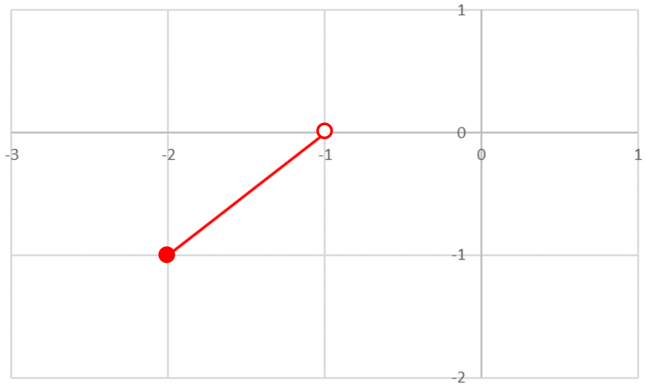


Now put them together into one graph.

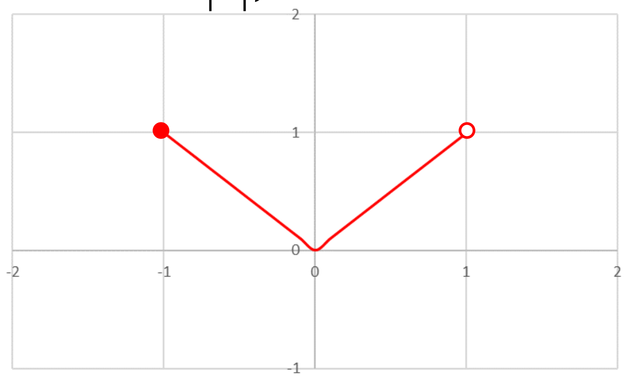
2. $g(x)=\begin{cases} x+1; -2\le x<-1 \\ |x| \;; -1\le x<1 \\ \sqrt{x} \;; 1\le x<4 \end{cases}$

Graph the three formulas separately.

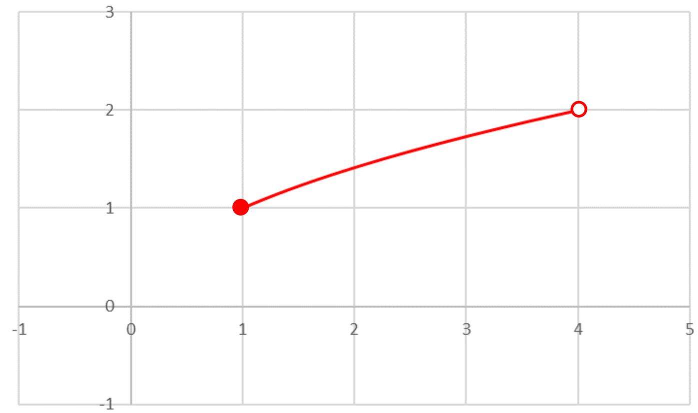
$x+1; -2\le x<-1$



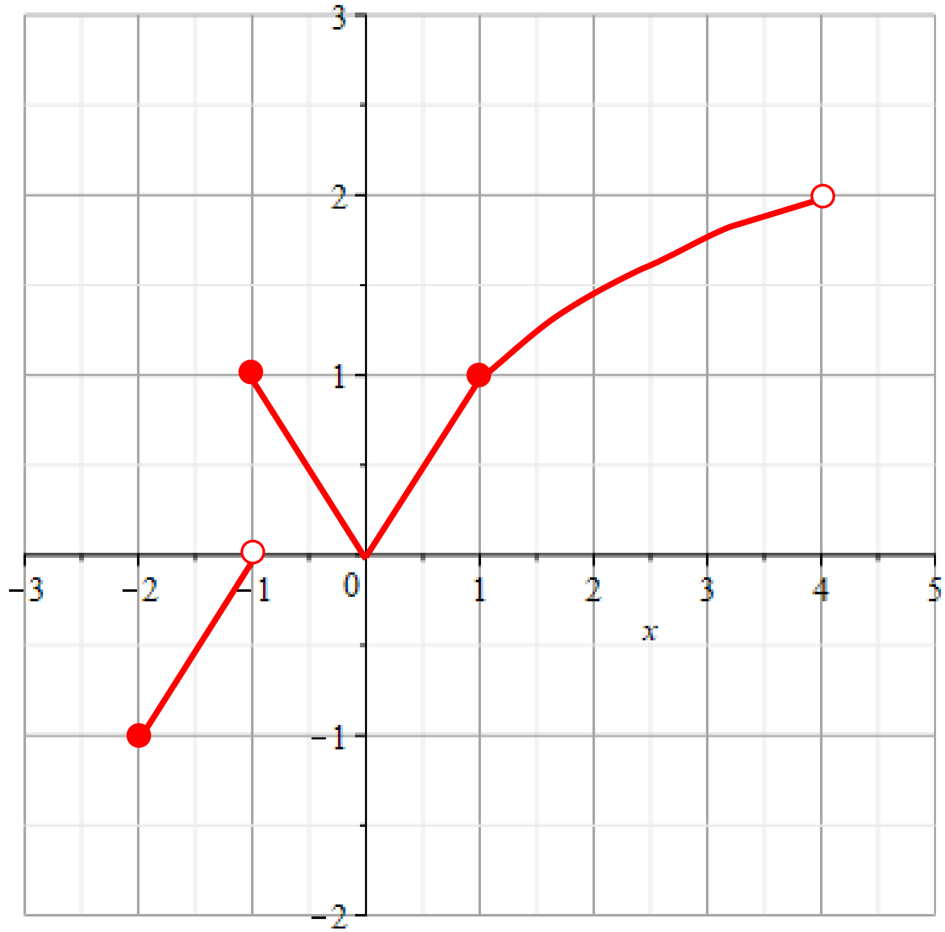
$|x|; -1\le x<1$



$\sqrt{x}; 1\le x<4$



Now put them together into one graph.



<u>Combinations of Functions:</u>

$$f+g,\ f-g,\ fg,\ \frac{f}{g},\ f\circ g$$

$$(f+g)(x)=f(x)+g(x)$$

$$(f-g)(x)=f(x)-g(x)$$

$$(fg)(x)=f(x)g(x)$$

$$\left(\frac{f}{g}\right)(x)=\frac{f(x)}{g(x)}$$

$$(f\circ g)(x)=f(g(x))$$

$$f(x)=x^2-2, \quad g(x)=\sqrt{x+1}$$

$(f+g)(0)$

$f(0)+g(0)$

$-2+1=\boxed{-1}$

$(f-g)(3)$

$f(3)-g(3)$

$7-2=\boxed{5}$

$(fg)(3)$

$f(3)\cdot g(3)$

$7\cdot 2=\boxed{14}$

$\left(\frac{f}{g}\right)(3)$

$\frac{f(3)}{g(3)}=\boxed{\frac{7}{2}}$

$(f\circ g)(3)$

$f(g(3))$

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

$(f+g)(-1)$

$f(-1)+g(-1)$

$-1+0=\boxed{-1}$

$(f-g)(-2)$

$f(-2)-g(-2)$

$2-\mathit{undefined}=\boxed{\mathit{undefined}}$

$\left(\frac{f}{g}\right)(-1)$

$\frac{f(-1)}{g(-1)}=\frac{-1}{0}=\boxed{\mathit{undefined}}$

$\left(\frac{f}{g}\right)(-2)$

$\frac{f(-2)}{g(-2)}=\frac{2}{\mathit{undefined}}=\boxed{\mathit{undefined}}$

$(g\circ f)(3)$

$g(f(3))$

$g(7)=\boxed{\sqrt{8}}$

$(g\circ f)(0)$

$g(f(0))$

$g(-2)=\boxed{\text{undefined}}$

$(f\circ f)(3)$

$f(f(3))$

$f(7)=\boxed{47}$

$(g\circ g)(3)$

$g(g(3))$

$g(2)=\boxed{\sqrt{3}}$

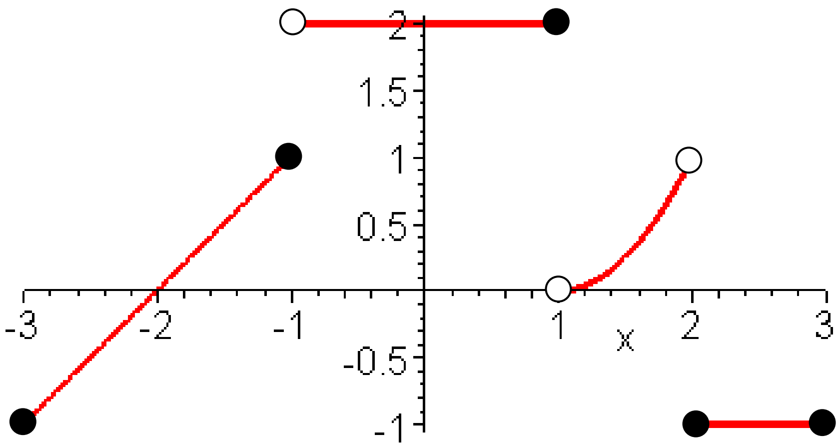
$(f\circ g\circ f)(\sqrt{5})$

$f\left(g\left(f\left(\sqrt{5}\right)\right)\right)$

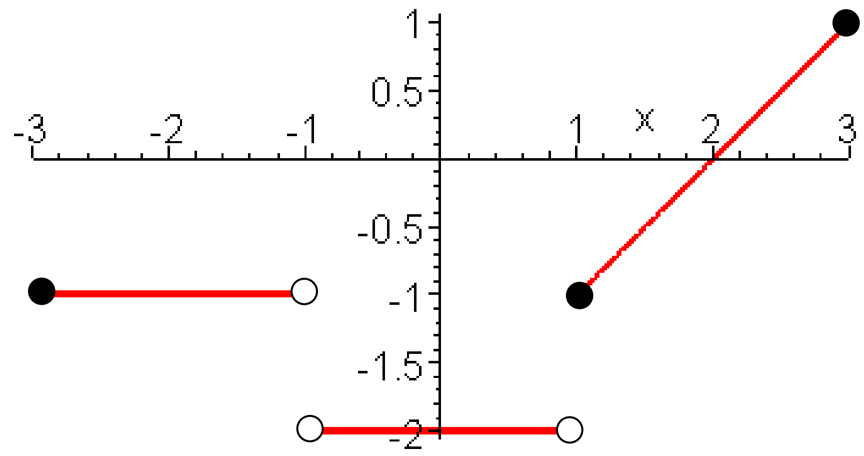
$f(g(3))=f(2)=\boxed{2}$

Combinations from Graphs:

Graph of *f*



Graph of *g*



$(f+g)(0)$

$2+-2=\boxed{0}$

$\left(\frac{f}{g}\right)(1)$

$\frac{2}{-1}=\boxed{-2}$

$(fg)(-3)$

$(-1)(-1)=\boxed{1}$

$(f\circ g)(2)$

$f(0)=\boxed{2}$

$(g\circ f)(2)$

$g(-1)=\boxed{undefined}$

$(g\circ g)(0)$

$g(-2)$

$\boxed{-1}$

$(f\circ f)(-1)$

$f(1)$

$\boxed{2}$

$(f\circ g\circ f)(1)$

$f(g(2))$

$f(0)=\boxed{2}$