$$f(x)=\begin{cases} x\ ; & x\geq 0 \\ -x\ ; & x<0 \end{cases}$$

$$f(x)=\begin{cases} 2x\ ; & x<2 \\ x+2\ ; & 2\leq x\leq 4 \\ 5\ ; & x>4 \end{cases}$$

$f\circ g(x)=f(g(x))$ — $f(g(x))$

$D_{fog}=$ $R_{f\circ g}=$

$f(x)=\frac{1}{x+2}$ and $D=\mathbb{R}-\{-2\}$, $R=\mathbb{R}-\{0\}$ $\quad g(x)=\frac{4}{x-1}$ $D=\mathbb{R}-\{1\}$, $R=\mathbb{R}-\{0\}$

$f\circ g(x)=f(g(x))=f\left(\frac{4}{x-1}\right)=\frac{1}{\frac{4}{x-1}+2}=\frac{x-1}{4+2x-2}=\frac{x-1}{2x+2}$

$D_{fog}=\mathbb{R}-\{1\}\Rightarrow\mathbb{R}-\{1,-1\}$

$g(x)=-2$

$\rightarrow \frac{4}{x-1}=-2 \Rightarrow 4=-2x+2\Rightarrow x=-1$

$h(x)=\frac{x-1}{2x+2}$

$f\circ g(x)=\frac{x-1}{2x+2}$ $\quad f(g(x))$

$D_{fog}=\mathbb{R}-\{1,-1\}$

$g(x)=-2$, $x=-1$

$R_{fog}=\mathbb{R}-\{0\}$

$D=\mathbb{R}-\{-2\}$, $f(x)=\frac{1}{x+2}$, $x=-2$, $\mathbb{R}-\{0\}$

$g(x)=\frac{4}{x-1}$, $\mathbb{R}-\{1\}$

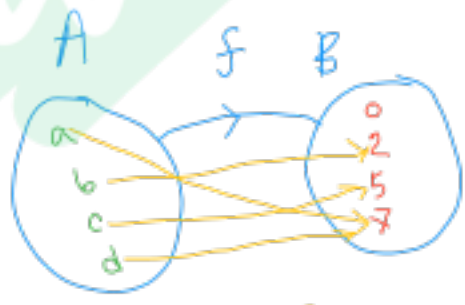
$R_f=\mathbb{R}-\{0\}$

$f\circ g$ ⟶ f composite with g

$g\circ f$ ⟶ g ⟷ f

Different Types of functions:

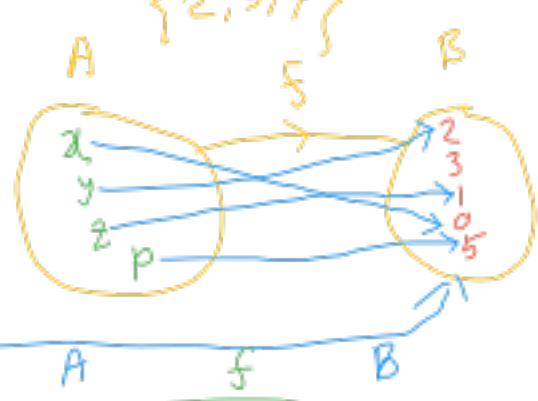
One One function:



$f(a)=7$ $\quad f(b)=2$

$f(c)=5$ $\quad f(d)=7$

$\{2,5,7\}$

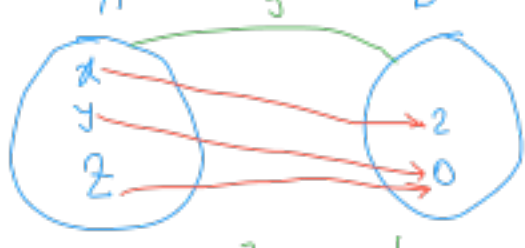


$f(x)=0$; $f(y)=2$

$f(z)=1$ $\quad f(p)=5$

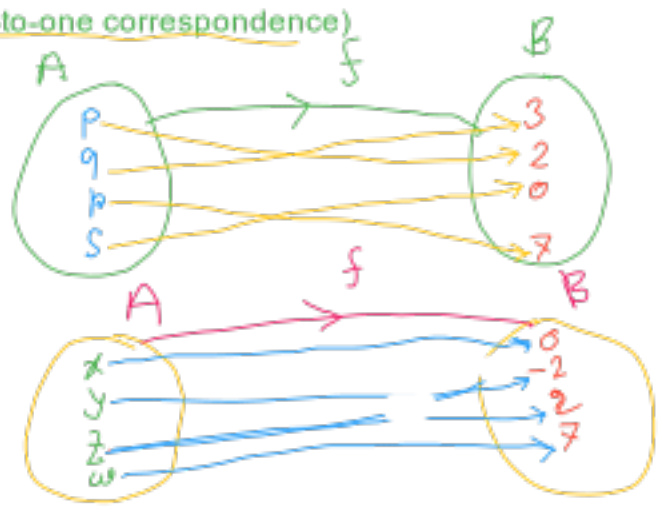
$\{0,1,2,5\}$

Onto Function



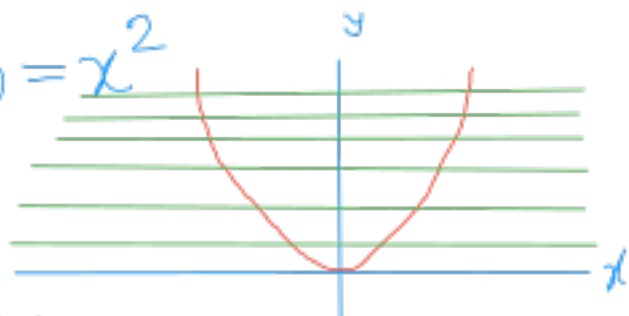
$R=\{2,0\}$

One-to-one Function (One-to-one correspondence)

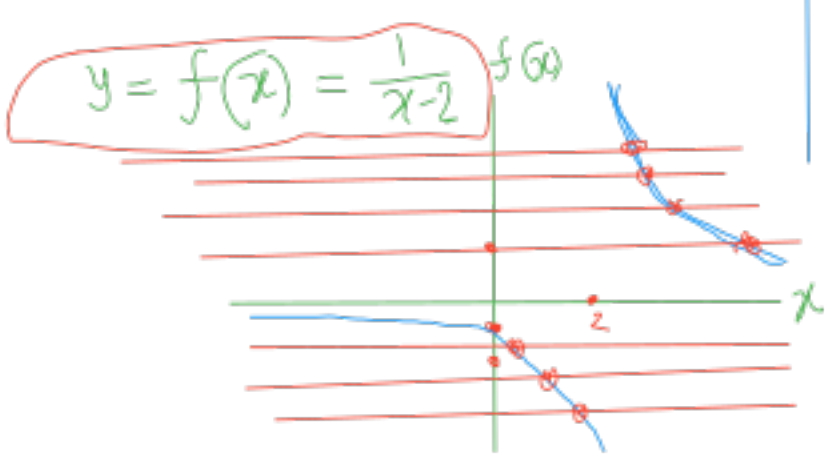


Horizontal Line Test

$y=f(x)=x^2$



$y=f(x)=\frac{1}{x-2}$



When a function is one-to-one, then the inverse of the function exists.