domain \( f = \{ 1, 3, 5, 9 \} \)

co-domain \( f = \{ 2, 3, 5, 6, 7, 8 \} \)

range \( f = \{ 2, 7, 8 \} \)

\[
y = f(x) \\
y = x^2 + 1 \\
x = 1
\]

For \( x \) such that \( f(x) = y \)

\[
f(x) = y_1 \\
f(x) = y_2
\]

range of \( f \) is also the co-domain
then that function \( f \) is surjective
or onto.

inverse of \( A = \{ 1, 5, 2 \} \)
Inverse of \( C \) = \( \{7, 12, 14\} \)

inverse of \( B \) = \( \emptyset \)

\[ x, x_2, \ldots, x \in X \quad y \in Y \]

\[ y = f(x) \quad x \in X \]

inverse of \( y = x \) \( y \in Y \)
For an injective function

\[ \forall x_1, x_2 \in X \text{ if } F(x_1) = F(x_2) \text{ then } x_1 = x_2 \]

\[ a, b \in D, \quad F(a) = F(b) \]

If \( F(a) = F(b) \), then \( a = b \)

leads to the conclusion

F is injective

\[ f(x) = 3x + 7 \]

Let us pick two values \( a, b \in X \) such that \( f(a) = 3a + 7 \)

\[ f(b) = 3b + 7 \]

Assume, \( f(a) = f(b) \)

\[ 3a + 7 = 3b + 7 \]

Subtract 7 from both sides

\[ 3a = 3b \]
divide by 3 on 5/5

\[ a = b \]

\[ f: \mathbb{Z} \to \mathbb{Z}, \quad f(x) = x \mod 7 \]

Let us pick \( a, b \in \mathbb{Z} \) arbitrarily such that \( f(a) = f(b) \)

\[ a = 15, \quad b = 22 \]

\[ 15 \mod 7 = 22 \mod 7 \]
\[ f : \mathbb{R} - \{1\} \rightarrow \mathbb{R} \]
\[ f(x) = \frac{x+1}{x-1} \]

Proof:

Let \( a, b \in \mathbb{I} \) such that \( f(a) = f(b) \)

\[ f(a) = \frac{a+1}{a-1} \]
\[ f(b) = \frac{b+1}{b-1} \]

If \( f(a) = f(b) \)

\[ \frac{a+1}{a-1} = \frac{b+1}{b-1} \]

\[ (a+1)(b-1) = (b+1)(a-1) \]

\[ ab - a + b - 1 = ab + a - b - 1 \]

Subtract \( ab \) on both sides.

\[ -a + b - 1 = a - b - 1 \]
Add 1 to both sides

\[-a + b = a - b\]
\[\delta + b = a + a\]
\[2b = 2a\]

\[\implies a = b\]

let \(c \in C\) [picked arbitrarily]

\[\exists d \in D\text{ such that } f(d) = c\]

\[f(x) = 3x + 7\]

Assign an arbitrary value

\[y = f(x)\]
\[y = 3x + 7\]
\[y - 7 = 3x\]
\[x = \frac{y - 7}{3}\]

\[x \in D\]
\[ f: \mathbb{R} \rightarrow \mathbb{Z} \quad f(x) = \lfloor x/2 \rfloor \]

Let \( c \in \mathbb{C} \) be chosen arbitrarily such that:

\[ c = \lfloor a/2 \rfloor \]

where \( a \in \mathbb{D} \)

\[ c < \frac{a}{2} < c + 1 \]

\[ a > 2c \]

\[ \text{Surjective} \]

\[ f: \mathbb{R}^+ \rightarrow \mathbb{R} \]

such that \( f(x) = \sqrt{x} \)

\[ x = -5 \]

\[ f(x) = \sqrt{-5} \]

\[ -5 \]

\[ \sqrt{-5} \]
\[ f : x \rightarrow y \]  
\[ g : y \rightarrow z \]  

\[ (g \circ f) : x \rightarrow z \]  

\[ (g \circ f)(x) = g(f(x)) \]  

Range of the first function is the domain of the second function.

\( f \) — first function
\( g \) — second function

\( g \circ f \) — \( g \) circle \( f \)
\[ g(f(x)) = g \circ f \circ f \circ x \]
\[(g \circ f)(1) = g(f(1)) = g(c) = z \]

\[(g \circ f)(2) = g(f(2)) = g(b) = y \]

\[(g \circ f)(3) = g(f(3)) = g(a) = y \]

\[(g \circ f)(n) = g(f(n)) = g(n+1) = (n+1)^2 \]
\((f \circ g)(n) = f(g(n))\)
\[= f(n^2)\]
\[= n^2 + 1\]
\[= (n+1)^2 \neq n^2 + 1\]
\[\therefore (g \circ f)(n) \neq (f \circ g)(n)\]