3.1 - Definition of Functions

What is a function?

Representations of Functions

- [ ]

- [ ]

- [ ]

<table>
<thead>
<tr>
<th>Team</th>
<th>Results</th>
<th>Element</th>
<th>Atomic Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington State</td>
<td>Win</td>
<td>Hydrogen</td>
<td>1.008</td>
</tr>
<tr>
<td>UNLV</td>
<td>Win</td>
<td>Helium</td>
<td>4.003</td>
</tr>
<tr>
<td>Citadel</td>
<td>Win</td>
<td>Lithium</td>
<td>6.941</td>
</tr>
<tr>
<td>Iowa</td>
<td>Win</td>
<td>Beryllium</td>
<td>9.012</td>
</tr>
<tr>
<td>Michigan</td>
<td>Win</td>
<td>Boron</td>
<td>10.81</td>
</tr>
<tr>
<td>Illinois</td>
<td>Loss</td>
<td>Carbon</td>
<td>12.01</td>
</tr>
<tr>
<td>Penn State</td>
<td>Loss</td>
<td>Nitrogen</td>
<td>14.01</td>
</tr>
</tbody>
</table>
The set of all possible inputs is called the 

The set of all possible outputs is called the 

**The Definition of a function.**

Let $A$ and $B$ be sets. A **function** from $A$ to $B$ is a rule of correspondence that


**Example.** Which of the following correspondences are functions?

-  

-  

-  

-  

**Functions defined by equations**

If $f$ is a function and $x$ is an input value, then

![Diagram]

The input variable is called the \textbf{ }.  

The output variable is called the \textbf{ }.
Domain and Range.

Unless otherwise specified, the **domain** of a function \( f \) is the set of

The **range** of a function \( f \) is the set of

**Example.** Find the domain of the following functions:

- \( f(x) = x^2 - x \)
- \( f(x) = \sqrt{1 - 4x} \)
- \( f(x) = \frac{1}{x - 1} \)
- \( f(x) = \frac{1}{x^2 + 4} \)
Example. Find the domain of the following functions:

\[
\begin{align*}
\bullet \quad f(x) &= \sqrt{\frac{1}{x^2 - 1}} \\
\bullet \quad f(x) &= \sqrt[3]{\frac{x - 2}{x + 1}}
\end{align*}
\]

Example. Let \( f(x) = \frac{x^2}{x - 4} \) Find

\[
\begin{align*}
\bullet \quad f(2) & \quad \bullet \quad f(-1) \\
\bullet \quad f(4) & \quad \bullet \quad f(a + 2)
\end{align*}
\]
Example. Let $f(x) = x^2 - x - 2$ Evaluate

- $f(x - 2)$
- $f(2x)$
- $f(x + h)$
- $f(x + h) - f(x)$

Example. Find the domain and range for $y = f(x) = \frac{x}{x + 1}$. 