Domain:
The domain of a function is the number set to which the independent variable belongs. Let’s review some number sets:

**Natural** ($\mathbb{N}$) = \{1, 2, 3, \ldots \}

**Integer** ($\mathbb{Z}$) = \{\ldots, −3, −2, −1, 0, 1, 2, 3, \ldots \}

**Rational** ($\mathbb{Q}$) = Set of numbers that can be expressed as $\frac{a}{b}$ where $a$ and $b$ are integers.

**Real** ($\mathbb{R}$) = Set of Rationals combined with **irrationals** (numbers with infinite, non-repeating decimals such as $\pi$ or $\sqrt{2}$).

**Complex** ($\mathbb{C}$) = Set of numbers in form $a + bi$ where $a, b \in \mathbb{R}$ and $i = \sqrt{-1}$.

We typically neglect to specify a domain when defining a function, therefore assuming that the domain is $\mathbb{R}$. Note, however, if $B = f(n) = \frac{n}{33}$ is the number of school buses needed as a function of the number of students in a school district (technically $S = f(n) = \lfloor n/33 \rfloor$), the domain for $B$ is $\mathbb{N}$ and the range is also $\mathbb{N}$, written $f : \mathbb{N} \rightarrow \mathbb{N}$.

1. Determine the best set(s) of numbers suited to the domain and range of these functions.
   
   (a) The amount of money an electrician makes as a function of time in hours.

   (b) The population of a town as a function of time in years.

   (c) The number of houses sold by a realtor as a function of the selling price.

   (d) The temperature as a function of the date in a year.

   (e) The length of the diagonal of a square as a function of its side.
2. (a) Sketch graphs of (i) an increasing function and (ii) a decreasing function.

(b) Write definitions for increasing and decreasing functions in terms of the independent variable \((x)\) and the dependent variable \((y)\).

Linear Functions:

3. Give an example of a direct (linear) proportion; include units of the constant of proportionality.
4. Complete the table below:

<table>
<thead>
<tr>
<th>$x$</th>
<th>-6</th>
<th>-3</th>
<th>0</th>
<th>3</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y = \frac{2}{3}x + 5$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. Sketch the graph of the table in (#4).

6. Take a moment to note how the changes in the $x$ and $y$ variables in the two previous questions are manifested.
6. Use the table below to answer the following questions:

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>f(x)</td>
<td>9</td>
<td>8</td>
<td>5</td>
<td>0</td>
<td>-7</td>
</tr>
</tbody>
</table>

(a) find \( f(4) \): _______

(b) Solve \( f(x) = 0 \): \( x = \)_______

(c) Find the average rate of change from \( x = 0 \) to \( x = 2 \) and then from \( x = 2 \) to \( x = 4 \).

What do you observe from your results?

7. The population of Half Moon Bay since 1995 can be modeled by the function \( P(t) = 10000(1.012)^t \) where \( t \) is in years. Find the average rate of growth in population from 1995 to 1997 and from 1999 to 2001. What do you observe from your results?