Coreq Support for Section 3.3

**Topic 1: Using the Vertical Line Test**
*(Video: Functions 6:43 – 11:35)*

When an $x$-coordinate is paired with more than one $y$-coordinate, a vertical line can be drawn that will intersect the graph at more than one point. We can use this fact to determine whether a relation is also a function. We call this the **vertical line test**.

**Topic 2: Using Function Notation**
*(Video: Functions 13:45 – 20:38)*

Consider the linear equation $y = 2x + 1$. This linear equation describes a function because every $x$-coordinate is paired with exactly one $y$-coordinate. The variable $y$ is a function of the variable $x$. We say the variable $x$ is the **independent variable** because any value in the domain can be assigned to $x$. The variable $y$ is the **dependent variable** because its value depends on $x$.

The symbol $f(x)$ means function of $x$ and is read “$f$ of $x$.” This notation is called **function notation**. The equation $y = 2x + 1$ can be written as $f(x) = 2x + 1$ using function notation. These equations have the same meaning. In other words, $y = f(x)$.

The notation $f(1)$ means replace $x$ with 1 and find the resulting $y$ or function value.

\[
\begin{align*}
  f(x) &= 2x + 1 \\
  f(1) &= 2(1) + 1 = 3
\end{align*}
\]

Since $f(1) = 3$, we know the ordered pair $(1,3)$ is a point on the graph of the linear function $f(x) = 2x + 1$. 
**Topic 3: Determining the Domain and Range of a Function from its Graph**

**Topic 4: Sketching the Graphs of Linear Functions**

A linear function has the form \( f(x) = mx + b \) where \( m \) is the slope of the line and \( b \) represents the \( y \)-coordinate of the \( y \)-intercept.

The **constant function** is defined by the equation \( f(x) = b \), the graph of which is a horizontal line.

The **identity function** defined by \( f(x) = x \) is another linear function with \( m = 1 \) and \( b = 0 \).