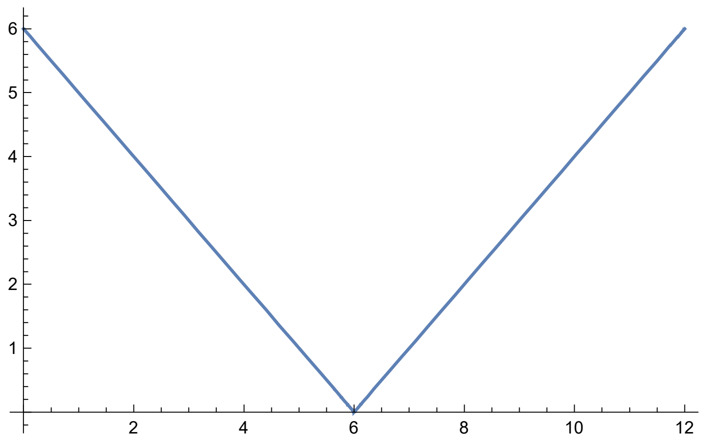
3.Given the function n(x)= Abs[x-6], it calls into question at what points the function is differentiable. The function is not differentiable at x=6 and it will be proiven in the following steps.
3a) Using the defined function n[x_]:=Abs[x-6], the where the function is differentiable will be made known.

```
n[x_] := Abs[x - 6]
```

The function was then plotted with a domain restriction from 0 to 12.

```
Plot[n[x], {x, 0, 12}]
```



The function is differentiable using the function from (-∞,6) ∪ (6,∞), and the function is not differentiable at x=6.
b.) Now calculating the derivative of the function n[x].

```
n'[x]
```

Abs′[-6 + x]

```
D[n[x], x]
```

Abs′[-6 + x]

```
ComplexExpand[Abs′[-6 + x]]
```

$$-\frac{6}{\sqrt{(-6+x)^2}}+\frac{x}{\sqrt{(-6+x)^2}}$$

$$\texttt{Simplify}\left[-\frac{6}{\sqrt{(-6+x)^2}}+\frac{x}{\sqrt{(-6+x)^2}}\right]$$

$$\frac{-6+x}{\sqrt{(-6+x)^2}}$$

Evaluating output 8 one notices that this is a derivative if the it were piecewise function into two functions which are manifests itself in something gets the square root the negative and positive, thus revealing that when x is less than six the derivative is -1, and when x is greater than 6 it is
The original function was put into a piecewise function to see if taking the derivative of the function would come out.

```
n := Piecewise[{{-6 + x, x ≥ 6}, {6 - x, x < 6}}]
```

$$\begin{cases} -6 + x & x \geq 6 \\ 6 - x & x < 6 \\ 0 & \text{True} \end{cases}$$

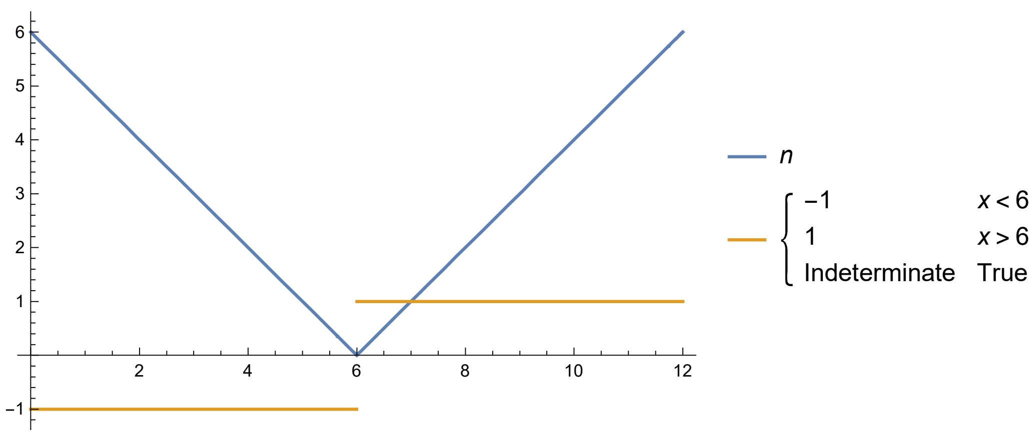
The Derivative of the piecewise function was then calculated, to see if it would compute.

```
D[n, x]
```

$$\begin{cases} -1 & x < 6 \\ 1 & x > 6 \\ \text{Indeterminate} & \text{True} \end{cases}$$

The derivative of the piecewise function was then constructed, and it yielded the actual derivative of the equation on the specific intervals. There was several attempts made on the derivative, and piecewise function because the piecewise function tried to define it in terms of x. The indeterminate true could be the similar to the piecewise above which was 0 true, because at that point the derivative is indeterminate, and the function is equal 0.
The graph of the piecewise and derivative were then done.

```
Plot[{n, Evaluate[In[9]]}, {x, 0, 12}, PlotRange → Automatic, PlotLegends -> "Expressions"]
```



The graph of the piecewise function had some trouble because the function would not graph correctly because of the severity of the piecewise function, thus it had to be evaluated first to understand what Mathematica was going to plot. The function plotted well, and thus it shows the derivative, and the original function. The derivative is shown be -1 for x values that less than 6 because the slope of the of piecewise absolute function at Out[6] is -1, and for all x greater than 6 the slope and derivative is 1. At x=6 the function is sharp turn, therefore the value is indeterminate. The derivative represents the slope for each piecewise function in the absolute piecewise function.