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Consider the function shown below
Say you want to find $\lim _{x \rightarrow} f(x)$, the positive sign in the limit
notation indicates a right-hand limit. If you think of the function as a highway and imagine you are traveling along the graph of $f(x)$ toward $x=4$ FROM THE RIGHT, NOT TO THE RIGHT, and you stop at the vertical line $x=4$, the value where you stop is 3 . Therefore, $\lim f(x)=3$.


You will use this graph to explore the limits for the problems on the next page

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## EX \#2: THINK ABOUT THIS!

If we think of the function as a highway, then the point at $(2,-1)$ could be considered the end of the road, while the point at $(-1,2)$ is more like a "pothole." How would you describe the points located at

$$
\begin{aligned}
& \text { Head end wlout a barrier } \\
& \text { bump in the road }
\end{aligned}
$$

Hopefully, this analogy gives you a visual reference for understanding limits from a graphical approach. Let's get a little more formal with our definition now.

When finding limits, ask yourself, "What is happening to $y$ as $x$ gets close to a certain number?" You are finding the $y$-value for which the function is approaching as $x$ approaches $c$.

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EX \#4: YOU OWN IT! In the box below, complete the sentence in your own words.

In order for the GENERAL LIMIT to exist, the function: must approach the Same $y$-vale from the left \& right hand side. However, the func. may not be defined there.

EX \#5: Sketch a graph to satisfy each set of conditions.


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EX \#6: Finding limits from a table of values
Now consider the function $f(x)=\frac{x-3}{x^{2}+2 x-15}$.
Complete the table below to find the limit as $x \rightarrow 3$.

| $x$ | 2.9 | 2.99 | 2.999 | ON$^{3}$ | 3.001 | 3.01 | 3.1 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| ${ }^{f(x)}$ | 0.1266 | .1252 | .1250 | indut. | .1249 | .1248 | .1235 |

Based on your analysis, what are the values of each of the limits below?
$\lim _{x \rightarrow 3^{-}} f(x)=.125 \quad \lim _{x \rightarrow 3^{+}} f(x)=, 125 \quad \lim _{x \rightarrow 3} f(x)=.125$


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