MAT127 **Supplementary Notes**

Chapter 2.2 The Limit of a Function

Topics: Definition of limit, one sided limits, infinite limits

Definition of limit. We write

if $f(x)$ gets closer and closer to L if we plug in values of x closer and closer to a. We also may write

Example 1 *Consider the function*

$$g(x) = \begin{cases} \frac{x-1}{x^2-1} & \text{if } x \neq 1 \\ 2 & \text{if } x = 1 \end{cases}$$

Using a calculator I computed the following table:

x	$g(x)$
.99	*.502513*
.999	*.500250*
.9999	*.500025*
1	*2 (!)*
1.0001	*.499975*
1.001	*.49975*
1.01	*.497512*

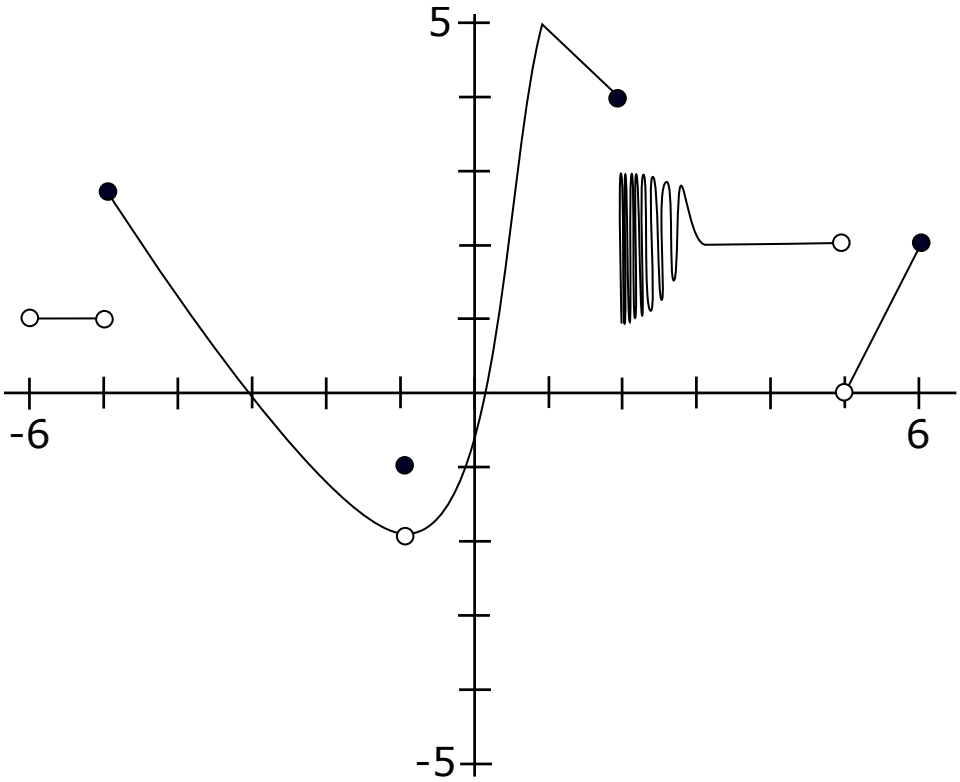
What do you think about $\lim_{x\to 1} g(x)$*?*

Example 2 *What is the one-sided limiting behavior of* $f(x) = \sqrt{x}$ *at* $x = 0$*?*

We have

if and only if

Example 3 *Discuss limiting behavior of the following graph*



Definition: A line $x = a$ is a *vertical asymptote* of the function $y = f(x)$ if

Example 4 *Determine*

$$\lim_{x \to 5^-} \frac{e^x}{(x-5)^3}.$$

Example 5 *Determine*

$$\lim_{x \to 1^+} \tan\left(\frac{\pi x^2}{2}\right).$$