11.1 Notes **Name ________________________**

Finding Limits Using Tables and Graphs (11.1)

Limits

Suppose that *f* is a function defined on some open interval containing the number *a*. The function *f* may or may not be defined at *a*.

Limit notation $\lim_{x \to a} f(x) = L$ **is read "the limit of *f(x)* as *x* approaches *a* equals the number *L*." This means as *x* gets closer to *a*, but remains unequal to *a*, the corresponding values of *f*(*x*) get closer to *L*.**

Finding a Limit Using a Table: Construct a table to find the indicated limit.

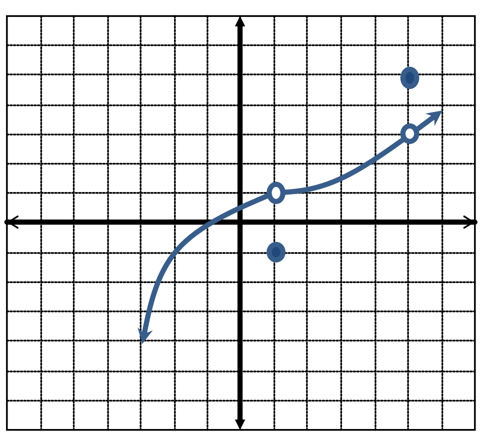
1) $\lim_{x \to 4} 3x^2$

2) $\lim_{x \to 0} \frac{x+1}{x^2+1}$

3) $\lim_{x \to 0} \frac{\sin x}{x}$

4) $\lim_{x \to 0} \frac{\cos x - 1}{x}$

Finding a Limit Using a graph: Use the graph of *f* to find the indicated limit and function value.



5) $\lim_{x \to 1} f(x)$

6) $f(1)$

7) $\lim_{x \to -2} f(x)$

8) $f(-2)$

9) $\lim_{x \to 5} f(x)$

10) $f(5)$

Equal and Unequal One-Sided Limits

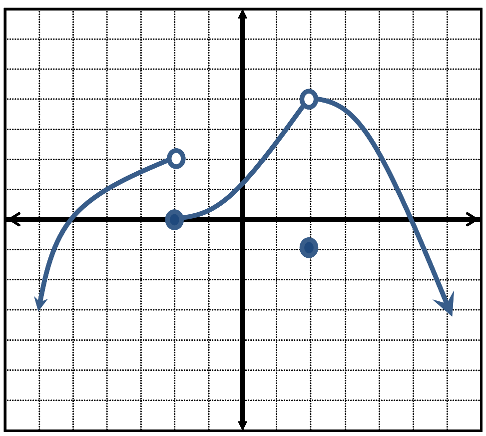
Equal One-Sided Limits:

$\lim_{x\to a} f(x) = L$ if and only if both $\lim_{x\to a^-} f(x) = L$ and $\lim_{x\to a^+} f(x) = L$.

Equal One-Sided Limits:

If $\lim_{x\to a^-} f(x) = L$ and $\lim_{x\to a^+} f(x) = M$, where $L \neq M$, then $\lim_{x\to a} f(x)$ does not exist.

One-Side Limits: The graph of a function f is given. Use the graph to find the indicated limits and function values, or state that a limit or function value does not exist.



11) $\lim_{x\to -2^-} f(x)$ **12)** $\lim_{x\to -2^+} f(x)$ **13)** $\lim_{x\to -2} f(x)$ **14)** $f(-2)$

15) $\lim_{x\to 2^-} f(x)$ **16)** $\lim_{x\to 2^+} f(x)$ **17)** $\lim_{x\to 2} f(x)$ **18)** $f(2)$

19) $\lim_{x\to 5^-} f(x)$ **20)** $\lim_{x\to 5^+} f(x)$ **21)** $\lim_{x\to 5} f(x)$ **22)** $f(5)$