<u>**Limit Laws from Section 1.4**</u>

Suppose that $\lim_{x\to a} f(x)$ and $\lim_{x\to a} g(x)$ exist. Then

Limit Law 1:	$\lim_{x\to a}\left[f(x)+g(x)\right]=\lim_{x\to a} f(x)+\lim_{x\to a} g(x)$
Limit Law 2:	$\lim_{x\to a}\left[f(x)-g(x)\right]=\lim_{x\to a} f(x)-\lim_{x\to a} g(x)$
Limit Law 3:	If *c* is a constant, then $\lim_{x\to a}\left[cf(x)\right]=c\lim_{x\to a} f(x)$
Limit Law 4:	$\lim_{x\to a}\left[\left(f(x)\right)\left(g(x)\right)\right]=\left(\lim_{x\to a} f(x)\right)\left(\lim_{x\to a} g(x)\right)$
Limit Law 5:	If $\lim_{x\to a} g(x)\neq 0$, then $\lim_{x\to a}\frac{f(x)}{g(x)}=\frac{\lim_{x\to a} f(x)}{\lim_{x\to a} g(x)}$
Limit Law 6:	$\lim_{x\to a}\left[\left(f(x)\right)^n\right]=\left[\lim_{x\to a} f(x)\right]^n$ where *n* is a positive integer.
Limit Law 7:	If c is a constant, then $\lim_{x\to a} c=c$
Limit Law 8:	$\lim_{x\to a} x=a$
Limit Law 9:	If *n* is a positive integer, then $\lim_{x\to a} x^n=a^n$.
Limit Law 10:	• If *n* is a positive odd integer, then $\lim_{x\to a}\sqrt[n]{x}=\sqrt[n]{a}$ • If *n* is a positive even integer and *a* > 0, then $\lim_{x\to a}\sqrt[n]{x}=\sqrt[n]{a}$
Limit Law 11:	• If *n* is a positive odd integer, then $\lim_{x\to a}\sqrt[n]{f(x)}=\sqrt[n]{\lim_{x\to a} f(a)}$ • If *n* is a positive even integer and $\lim_{x\to a} f(a)>0$, then $\lim_{x\to a}\sqrt[n]{f(x)}=\sqrt[n]{\lim_{x\to a} f(a)}$
Direct Substitution Property:	• If f is a polynomial, then $\lim_{x\to a} f(x)=f(a)$. • If f is a rational function and *a* is in the domain of f, then $\lim_{x\to a} f(x)=f(a)$.
Fact from p. 38:	If $f(x)=g(x)$ for all *x* such that $x\neq a$, then $\lim_{x\to a} f(x)$ and $\lim_{x\to a} g(x)$ will agree. That is, • If one of the limits exists and has value *L*, then the other limit exists and has value *L*. • If one of the limits does not exist, then the other limit does not exist.
Theorem 2:	$\lim_{x\to a} f(x)=L$ if and only if $\left(\lim_{x\to a^-} f(x)=L\right) AND \left(\lim_{x\to a^+} f(x)=L\right)$.
Theorem 3:	If $f(x)\leq g(x)$ when *x* is near *a* (except possibly at *a*), and if both $\lim_{x\to a} f(x)$ and $\lim_{x\to a} g(x)$ exist, then $\lim_{x\to a} f(x)\leq\lim_{x\to a} g(x)$.
Squeeze Theorem:	If $f(x)\leq g(x)\leq h(x)$ when *x* is near *a* (except possibly at *a*), and if both $\lim_{x\to a} f(x)=L$ and $\lim_{x\to a} h(x)=L$, then $\lim_{x\to a} g(x)=L$.
Fact #5 from p. 42:	$\lim_{\theta\to 0}\frac{\sin(\theta)}{\theta}=1$