## 1 General Limit Laws

Suppose $\lim _{x \rightarrow a} f(x)$ and $\lim _{x \rightarrow a} g(x)$ both exist, and let $c$ be any constant.

1. Sum Law: $\quad \lim _{x \rightarrow a}[f(x)+g(x)]=\lim _{x \rightarrow a} f(x)+\lim _{x \rightarrow a} g(x)$
2. Difference Law: $\quad \lim _{x \rightarrow a}[f(x)-g(x)]=\lim _{x \rightarrow a} f(x)-\lim _{x \rightarrow a} g(x)$
3. Constant Multiplier Law: $\lim _{x \rightarrow a}[c f(x)]=c \lim _{x \rightarrow a} f(x)$
4. Product Law: $\quad \lim _{x \rightarrow a}[f(x) g(x)]=\left(\lim _{x \rightarrow a} f(x)\right)\left(\lim _{x \rightarrow a} g(x)\right)$
5. Quotient Law: $\quad \lim _{x \rightarrow a}\left[\frac{f(x)}{g(x)}\right]=\frac{\lim _{x \rightarrow a} f(x)}{\lim _{x \rightarrow a} g(x)}$ provided $\lim _{x \rightarrow a} g(x) \neq 0$.
6. Power Law: $\quad \lim _{x \rightarrow a}[f(x)]^{n}=\left[\lim _{x \rightarrow a} f(x)\right]^{n}$ where $n$ is a positive integer.
7. Root Law: $\quad \lim _{x \rightarrow a} \sqrt[n]{f(x)}=\sqrt[n]{\lim _{x \rightarrow a} f(x)}$ where $n$ is a positive integer, and where $\lim _{x \rightarrow a} f(x)>0$ if $n$ is even.

## 2 Particular Limit Results

1. Constants:
$\lim _{x \rightarrow a} c=c$
2. Limit of $f(x)=x: \quad \lim _{x \rightarrow a} x=a$
3. Polynomials: If $f(x)$ is a polynomial (for eg. $f(x)=5 x^{3}-\pi x^{2}-1 / 2$ ) then $\lim _{x \rightarrow a} f(x)=f(a)$.
4. Rational Functions:

If $f(x)$ and $g(x)$ are polynomials and $g(a) \neq 0$ then $\lim _{x \rightarrow a} \frac{f(x)}{g(x)}=\frac{f(a)}{g(a)}$.
5. Squeeze Theorem: If $f(x) \leq g(x) \leq h(x)$ for $x$ near $a$ and $\lim _{x \rightarrow a} f(x)=\lim _{x \rightarrow a} h(x)=L$, then $\lim _{x \rightarrow a} g(x)=L$.
6. Important Trig Limit: $\quad \lim _{x \rightarrow 0} \frac{\sin (x)}{x}=1$

