The Laws of Limits

Given a constant c and two functions $f(x)$ and $g(x)$ such that both $\lim_{x \to a} f(x)$ and $\lim_{x \to a} g(x)$ exist, then the following conclusions can be drawn:

1. $\lim_{x \to a}\left(f(x) + g(x)\right) = \lim_{x \to a} f(x) + \lim_{x \to a} g(x)$
2. $\lim_{x \to a}\left(f(x) - g(x)\right) = \lim_{x \to a} f(x) - \lim_{x \to a} g(x)$
3. $\lim_{x \to a}\left(cf(x)\right) = c\lim_{x \to a} f(x)$
4. $\lim_{x \to a}\left(f(x)g(x)\right) = \lim_{x \to a} f(x)\lim_{x \to a} g(x)$
5. $\lim_{x \to a}\left(\frac{f(x)}{g(x)}\right) = \frac{\lim_{x \to a} f(x)}{\lim_{x \to a} g(x)}$ Note: $\lim_{x \to a} g(x) \neq 0$.
6. $\lim_{x \to a}\left[f(x)\right]^n = \left[\lim_{x \to a} f(x)\right]^n$
7. $\lim_{x \to a} c = c$
8. $\lim_{x \to a} x = a$
9. $\lim_{x \to a} x^n = a^n$
10. $\lim_{x \to a} \sqrt[n]{x} = \sqrt[n]{a}$ Note: If n is even, we assume $a \geq 0$.
11. $\lim_{x \to a} \sqrt[n]{f(x)} = \sqrt[n]{\lim_{x \to a} f(x)}$ Note: If n is even, we assume $\lim_{x \to a} f(x) \geq 0$.