Basic Limits

1. $\lim\limits_{x \to c} k =$

2. $\lim\limits_{x \to c} x =$

Properties of Limits

Suppose $\lim\limits_{x \to c} f(x)$ and $\lim\limits_{x \to c} g(x)$ exist and k is a constant, then

3. $\lim\limits_{x \to c}[f(x) \pm g(x)] = \lim\limits_{x \to c} f(x) \pm \lim\limits_{x \to c} g(x)$

4. $\lim\limits_{x \to c} kf(x) = k \lim\limits_{x \to c} f(x)$

5. $\lim\limits_{x \to c}[f(x) \cdot g(x)] = \lim\limits_{x \to c} f(x) \cdot \lim\limits_{x \to c} g(x)$

6. $\lim\limits_{x \to c} \dfrac{f(x)}{g(x)} = \dfrac{\lim\limits_{x \to c} f(x)}{\lim\limits_{x \to c} g(x)}$, if $\lim\limits_{x \to c} g(x) \neq 0$

7. $\lim\limits_{x \to c} x^n = c^n$ for positive integer n

The Limit Properties on page 1 lead to the following two Properties:

8. For a polynomial function $f(x) = a_n x^n + a_{n-1}x^{n-1} + \cdots + a_1 x + a_0$,

the $\lim\limits_{x \to c} f(x)$ can be found by

i.e $\lim\limits_{x \to c} f(x) =$

Ex Find the following limit, if it exists $\lim\limits_{x \to 2}(2x^3 - x + 1)$

9. For a rational function $h(x) = \dfrac{f(x)}{g(x)}$ where $f(x)$ and $g(x)$ are both polynomials,

the $\lim\limits_{x \to c} h(x)$ can be found by

i.e $\lim\limits_{x \to c} h(x) = \qquad = \dfrac{f(c)}{g(c)}, \quad g(c) \neq 0$

Ex Find the following limit, if it exists $\lim\limits_{x \to -1} \dfrac{2x - 3}{1 + x^2}$

Even More Special Limits and Laws

10. $\lim\limits_{x \to c}[f(x)]^n = [\lim\limits_{x \to c} f(x)]^n$ for positive integer n

11. $\lim\limits_{x \to c} x^{1/n} = \lim\limits_{x \to c} \sqrt[n]{x} = \sqrt[n]{c}$ for positive integer n and if n is even, $c \geq 0$

12. $\lim\limits_{x \to c}[f(x)]^{1/n} = \lim\limits_{x \to c} \sqrt[n]{f(x)} = \sqrt[n]{\lim\limits_{x \to c} f(x)}$ for positive integer n. [In the case that n is even, $f(x) \geq 0$]