

# Limit

Definition: A value that a function approaches.

If a function approaches to same value from both right and left side for a point, we call the value as limit.

The point itself may be valid or not.

$$\lim_{x \rightarrow 2} (8 - 3x + 12x^2)$$

$$48 + 8 - 6 = 50$$

$$\lim_{t \rightarrow 3} \frac{6 + 4t}{t^2 + 1}$$

$$\frac{18}{10} = 1.8$$

$$\lim_{x \rightarrow 5} \frac{x^2 - 25}{x^2 + 4x - 15}$$

$$\frac{0}{0} \left[ \frac{(x-5)(x+5)}{(x+5)(x-3)} \right] = \frac{-10}{-8} = \frac{5}{4}$$

$$\lim_{x \rightarrow 8} \frac{2x^2 - 17x + 8}{8 - x}$$

$$\frac{(2x-1)(x-8)}{8-x} = -15$$

$$\lim_{y \rightarrow 7} \frac{y^2 - 4y - 21}{3y^2 - 17y - 28}$$

$$\frac{(y+3)(y-7)}{(3y+4)(y-7)} = \frac{10}{25}$$

$$\lim_{h \rightarrow 0} \frac{(6+h)^2 - 36}{h}$$

$$\frac{36 + 12h + h^2 - 36}{h}$$

$$\frac{h(12+h)}{h} = 12$$

$$\lim_{x \rightarrow 4} \frac{\sqrt{x} - 2}{x - 4}$$

$$\frac{\frac{\sqrt{x}-2}{(\sqrt{x}-2)(\sqrt{x}+2)}}{(\sqrt{x}-2)(\sqrt{x}+2)} = \frac{1}{4}$$

$$\lim_{x \rightarrow -3} \frac{\sqrt{2x+22} - 4}{x+3}$$

$$\frac{\sqrt{2x+22} - 4}{x+3} \cdot \frac{\sqrt{2x+22} + 4}{\sqrt{2x+22} + 4}$$

$$\frac{2(x+3)}{(x+3)(\sqrt{2x+22} + 4)} = \frac{2}{8}$$

$$\lim_{x \rightarrow 4} \frac{\sqrt{x} - 2}{x - 4}$$

$$\frac{\frac{\sqrt{x}-2}{(\sqrt{x}-2)(\sqrt{x}+2)}}{(\sqrt{x}-2)(\sqrt{x}+2)} = \frac{1}{4}$$

$$\lim_{x \rightarrow 0} \frac{x}{3 - \sqrt{x+9}}$$

$$\frac{x}{3 - \sqrt{x+9}} \cdot \frac{3 + \sqrt{x+9}}{3 + \sqrt{x+9}}$$

$$\frac{x(3 + \sqrt{x+9})}{-x} = -6$$

$$f(x) = \begin{cases} 7 - 4x & x < 1 \\ x^2 + 2 & x \geq 1 \end{cases}$$

$$\lim_{x \rightarrow -6} f(x)$$

$$7 + 24 = 31$$

$$\lim_{x \rightarrow 1} f(x)$$

$$7 - 4 = 1 + 2$$

$$f(x) = \begin{cases} 6x & x \leq -4 \\ 1 - 9x & x > -4 \end{cases}$$

$$\lim_{x \rightarrow -4} f(x)$$

$$-24 \neq 1 + 36$$

$$\lim_{x \rightarrow 5} (10 + |x-5|)$$

$$10 + (x-5) = 10 \quad 10 = 10$$

$$10 - (x-5) = 10$$

$$\lim_{t \rightarrow -1} \frac{t+1}{|t+1|}$$

$$\frac{t+1}{t+1} = 1 \quad \frac{t+1}{-(t+1)} = -1 \quad 1 \neq -1$$