Calculating Limits

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Abstract

In this section I will be going over how to calculate limits on a particular set of problems. This solutions are made solely by myself and used for demostration.

Number 11:

$$\lim_{x\to 5}\frac{x^2-6x+5}{x-5}$$

$$\begin{aligned}
\lim_{x\to 5}\frac{x^2-6x+5}{x-5} &= L\\
\lim_{x\to 5}\frac{(x-5)(x-1)}{x-5} &= L\\
\lim_{x\to 5}\frac{\cancel{(x-5)}(x-1)}{\cancel{(x-5)}} &= L\\
\lim_{x\to 5}(x-1) &= L\\
(x-1)\Big|_{x=5} = (5-1) = 4 &= L
\end{aligned}$$

Solution:

$$\lim_{x\to 5}\frac{x^2-6x+5}{x-5} = 4$$

Number 12:

$$\lim_{x\to 4}\frac{x^2-4x}{x^2-3x-4}$$

$$\begin{aligned}
\lim_{x\to 4}\frac{x^2-4x}{x^2-3x-4} &= L\\
\lim_{x\to 4}\frac{x(x-4)}{(x+1)(x-4)} &= L\\
\lim_{x\to 4}\frac{x\cancel{(x-4)}}{(x+1)\cancel{(x-4)}} &= L\\
\lim_{x\to 4}\frac{x}{x+1} &= L\\
\frac{x}{x+1}\Big|_{x=4} = \frac{4}{4+1} = \frac{4}{5} &= L
\end{aligned}$$

Solution:

$$\lim_{x\to 4}\frac{x^2-4x}{x^2-3x-4} = \frac{4}{5}$$

Number 13:

$$\lim_{x\to 5} x^2-5x+6x-5$$

$$\begin{aligned}
\lim_{x\to 5}\frac{x^2-5x+6}{x-5} &= L\\
\frac{x^2-5x+6}{x-5}\Big|_{x=5} = \frac{(5)^2-5(5)+6}{5-5} = \frac{6}{0} &= L
\end{aligned}$$

Solution: Since it is not possible to divide zero the limit does not exist.

Number 14:

$$\lim_{x\to -1} \frac{x^2-4x}{x^2-3x-4}$$

$$\begin{aligned} \lim_{x\to -1} \frac{x^2-4x}{x^2-3x-4} &= L \\ \left.\frac{x^2-4x}{x^2-3x-4}\right|_{x=-1} = \frac{(-1)^2-4(-1)}{(-1)^2-3(-1)-4} = \frac{5}{0} &= L \end{aligned}$$

Solution: Since it is not possible to divide by zero therefore the limit does not exist.

Number 15:

$$\lim_{t\to -3} \frac{t^2-9}{2t^2+7t+3}$$

$$\begin{aligned} \lim_{t\to -3} \frac{t^2-9}{2t^2+7t+3} &= L \\ \lim_{t\to -3} \frac{(t+3)(t-3)}{(2t+1)(x+3)} &= L \\ \lim_{t\to -3} \frac{\cancel{(t+3)}(t-3)}{(2t+1)\cancel{(x+3)}} &= L \\ \left.\frac{t-3}{2t+1}\right|_{t=-3} = \frac{-3-3}{2(-3)+1} = \frac{6}{5} &= L \end{aligned}$$

Solution:

$$\lim_{t\to -3} \frac{t^2-9}{2t^2+7t+3} = \frac{6}{5}$$

Number 16:

$$\lim_{x\to -1} \frac{2x^2+3x+1}{x^2-2x-3}$$

$$\begin{aligned} \lim_{x\to -1} \frac{2x^2+3x+1}{x^2-2x-3} &= L \\ \lim_{x\to -1} \frac{(2x+1)(x+1)}{(x+1)(x-3)} &= L \\ \lim_{x\to -1} \frac{(2x+1)\cancel{(x+1)}}{\cancel{(x+1)}(x-3)} &= L \\ \left.\frac{2x+1}{x-3}\right|_{x=-1} = \frac{(2(-1)+1)}{(-1)-3} = \frac{1}{4} &= L \end{aligned}$$

Solution:

$$\lim_{x\to -1} \frac{2x^2+3x+1}{x^2-2x-3} = \frac{1}{4}$$

Number 17

$$\lim h \to 0 \frac{(-5+h)^2-25}{h}$$

$$\begin{aligned}
\lim_{h\to 0} \frac{(-5+h)^2-25}{h} &= L \\
\lim_{h\to 0} \frac{25-10h+h^2-25}{h} &= L \\
\lim_{h\to 0} \frac{h(-10+h)}{h} &= L \\
\lim_{h\to 0} \frac{\cancel{h}(-10+h)}{\cancel{h}} &= L \\
(-10+h)\Big|_{h=0} = (-10+0) = -10 &= L
\end{aligned}$$

Solution:

$$\lim h \to 0 \frac{(-5+h)^2-25}{h} = -10$$

Number 18

$$\lim_{h\to 0} \frac{(2+h)^3-8}{h}$$

$$\begin{aligned}
\lim_{h\to 0} \frac{(2+h)^3-8}{h} &= L \\
\lim_{h\to 0} \frac{8+4h+2h^2+h^3-8}{h} &= L \\
\lim_{h\to 0} \frac{h(4+2h+h^2)}{h} &= L \\
\lim_{h\to 0} \frac{\cancel{h}(4+2h+h^2)}{\cancel{h}} &= L \\
(4+2h+h^2)\Big|_{h=0} = 4+0+0 = 4 &= L
\end{aligned}$$

Solution:

$$\lim_{h\to 0} \frac{(2+h)^3-8}{h} = 4$$

Number 19

$$\lim x \to -2 \frac{x+2}{x^3+8}$$

$$\lim_{x \to -2} \frac{x+2}{(x+2)(x^2-2x+4)} = L$$

$$\lim_{x \to -2} \frac{\cancel{x+2}}{\cancel{(x+2)}(x^2-2x+4)} = L$$

$$\lim_{x \to -2} \frac{1}{x^2-2x+4} = L$$

$$\left.\frac{1}{x^2-2x+4}\right|_{x=-2} = \frac{1}{4+4+4} = \frac{1}{12} = L$$

Solution:

$$\lim_{x \to -2} \frac{x+2}{x^3+8} = \frac{1}{12}$$