

C12 - 1.4 - Algebra Limits Notes

$\lim_{x \rightarrow 1} x^2 + 1$ $(1^*)^2 + 1$ (2)	<table border="1"> <tr> <th>x</th> <th>y</th> </tr> <tr> <td>0.999</td> <td>1.998</td> </tr> <tr> <td>1</td> <td>Don't Care</td> </tr> <tr> <td>1.001</td> <td>2.002</td> </tr> </table>	x	y	0.999	1.998	1	Don't Care	1.001	2.002
x	y								
0.999	1.998								
1	Don't Care								
1.001	2.002								

$$\lim_{x \rightarrow 1} \frac{1}{x-1} \quad \lim_{x \rightarrow 1} \frac{1}{x^2-1}$$

DNE **∞**

Can't divide by zero

$$\lim_{x \rightarrow 1} \frac{1}{x^2+1} = \frac{1}{2}$$

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

$$\lim_{x \rightarrow 2} \frac{x}{x-3} = \frac{2}{2-3} = \mathbf{-2}$$

$$\lim_{x \rightarrow -2} \frac{2x^2 + 7x + 6}{x+2}$$

$$\lim_{x \rightarrow -3} 2x + 3 = 2(-3) + 3 = \mathbf{-3}$$

$$\lim_{x \rightarrow 2} \frac{x^2 - 4}{x^3 - 8}$$

$$\lim_{x \rightarrow 2} \frac{(x-2)(x+2)}{(x-2)(x^2 + 2x + 2^2)}$$

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

$$\lim_{x \rightarrow 1} \frac{x-1}{x^4-1}$$

$$\lim_{x \rightarrow 1} \frac{x-1}{(x^2+1)(x^2-1)}$$

$$\lim_{x \rightarrow 1} \frac{x-1}{(x^2+1)(x+1)(x-1)}$$

$$\lim_{x \rightarrow 1} \frac{1}{(x^2+1)(x+1)} = \mathbf{\frac{1}{4}}$$

Do it in your head!

$$\lim_{x \rightarrow 0} \frac{1}{x+3} - \frac{1}{3}$$

$$\lim_{x \rightarrow 0} \frac{1}{x+3} - \frac{1}{3} \times \frac{3(x+3)}{3(x+3)}$$

$$\lim_{x \rightarrow 0} \frac{3 - (x+3)}{3x(x+3)}$$

$$\lim_{x \rightarrow 0} \frac{-x}{3x(x+3)}$$

$$\lim_{x \rightarrow 0} \frac{-1}{3(x+3)} = \mathbf{-\frac{1}{9}}$$

$$3 \times \frac{1}{x+3} - \frac{1}{3} \times (x+3)$$

$$3 \times \frac{-x}{3(x+3)} - \frac{1}{3} \times (x+3)$$

Add Fractions

$$\frac{-x}{3(x+3)}$$

$$\frac{-x}{3(x+3)} \times \frac{1}{x}$$

Flip and Multiply

$$\frac{-1}{3(x+3)}$$

$$\lim_{h \rightarrow 0} \frac{1}{x+h} - \frac{1}{x}$$

$$\lim_{h \rightarrow 0} \frac{1}{x+h} - \frac{1}{x} \times \frac{x(x+h)}{x(x+h)}$$

$$\lim_{h \rightarrow 0} \frac{x - (x+h)}{xh(x+h)}$$

$$\lim_{h \rightarrow 0} \frac{-h}{xh(x+h)}$$

$$\lim_{h \rightarrow 0} \frac{-1}{x(x+h)} = \mathbf{-\frac{1}{x^2}}$$

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

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

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

$$\lim_{x \rightarrow 9} 3 + \sqrt{x} = \mathbf{6}$$

Conjugate

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

Only FOIL the Conj. 1

$$\lim_{x \rightarrow 11} \frac{\sqrt{x-2} - 3}{x-11} \times \frac{\sqrt{x-2} + 3}{\sqrt{x-2} + 3} \times \frac{1}{3(x+3)}$$

$$\lim_{x \rightarrow 11} \frac{1}{(x-11)(\sqrt{x-2} + 3)}$$

$$\lim_{x \rightarrow 11} \frac{1}{(\sqrt{(11)-2} + 3)} = \mathbf{\frac{1}{6}}$$