

LESSON 2.3: BASIC LIMIT LAWS

	Name	Law
	Sum Law	$\lim_{x \rightarrow c} (f(x) + g(x)) = \lim_{x \rightarrow c} f(x) + \lim_{x \rightarrow c} g(x)$
	Constant Multiple Law	$\lim_{x \rightarrow c} k f(x) = k \left[\lim_{x \rightarrow c} f(x) \right]$
	Product Law	$\lim_{x \rightarrow c} f(x) g(x) = \left[\lim_{x \rightarrow c} f(x) \right] \left[\lim_{x \rightarrow c} g(x) \right]$
	Quotient Law	$\lim_{x \rightarrow c} \frac{f(x)}{g(x)} = \frac{\lim_{x \rightarrow c} f(x)}{\lim_{x \rightarrow c} g(x)}$
	Powers and Roots	$\lim_{x \rightarrow c} [f(x)]^{p/q} = \left(\lim_{x \rightarrow c} f(x) \right)^{p/q}$
BASIC LIMIT laws	Examples: Evaluate each of the limits below.	
	1. $\lim_{x \rightarrow 4} -x^3 = -\left(\lim_{x \rightarrow 4} x\right)^3$ $= -(4)^3$ $= -64$	2. $\lim_{x \rightarrow -1} 2x^2 - 3x + 1$ $= 2(-1)^2 - 3(-1) + 1$ $= 2(1) + 3 + 1$ $= 6$
	3. $\lim_{x \rightarrow 2} \sqrt{x^3 + 4x - 1}$ $= \sqrt{\lim_{x \rightarrow 2} (x^3 + 4x - 1)}$ $= \sqrt{(2)^3 + 4(2) - 1}$ $= \sqrt{8 + 8 - 1}$ $= \sqrt{15}$	4. $\lim_{t \rightarrow -2} \frac{t+4}{3t^3} = \frac{\lim_{t \rightarrow -2} t+4}{\lim_{t \rightarrow -2} 3t^3}$ $= \frac{(-2)+4}{3(-2)^3}$ $= \frac{2}{-24}$ $= -\frac{1}{12}$
	5. $\lim_{t \rightarrow 1} t^{-\frac{1}{3}}(t+3)^{\frac{1}{2}} = \left[\lim_{t \rightarrow 1} t\right]^{-\frac{1}{3}} \left[\lim_{t \rightarrow 1} t+3\right]^{\frac{1}{2}}$ $= (1)^{-\frac{1}{3}} (1+3)^{\frac{1}{2}}$ $= (1)(4)^{\frac{1}{2}}$ $= (1)(2)$ $= 2$	6. What happens when you try to apply the product rule to: $\lim_{x \rightarrow 0} (x)(x^{-1})$ $\left[\lim_{x \rightarrow 0} x \right] \left[\lim_{x \rightarrow 0} \frac{1}{x} \right]$ $\uparrow \qquad \qquad \uparrow$ $0 \qquad \qquad \text{DNE}$ The product rule cannot be used because $\lim_{x \rightarrow 0} \frac{1}{x}$ does not exist.