Two Lies and a Truth Activity: Topic 1.6 Name ___________________________

For each of the following limit problems, three solutions are provided. Two of the solutions show an incorrect answer where one solution shows a correct answer. Circle **True** if the solution is correct, or true, or circle **Lie** if the solution is incorrect, and thus a lie. For each solution this is a "lie," circle where error occurs.

Problem 1 $\lim_{x\to 1}\frac{x^3-1}{x^2+7x-8}$	$\lim_{x\to 1}\frac{x^3-1}{x^2+7x-8}$ $=\lim_{x\to 1}\frac{(x-1)(x-1)(x-1)}{(x-1)(x+8)}$ $=\lim_{x\to 1}\frac{(x-1)^2}{x+8}$ $=-\frac{0^2}{9}$ $=0$ **True** **Lie**	$\lim_{x\to 1}\frac{x^3-1}{x^2+7x-8}$ $=\lim_{x\to 1}\frac{(x-1)(x^2+x+1)}{(x-1)(x+8)}$ $=\lim_{x\to 1}\frac{x^2+x+1}{x+8}$ $=\frac{3}{9}$ or $\frac{1}{3}$ **True** **Lie**	$\lim_{x\to 1}\frac{x^3-1}{x^2+7x-8}$ $=\lim_{x\to 1}\frac{(x-1)(x^2-x+1)}{(x-1)(x+8)}$ $=\lim_{x\to 1}\frac{x^2-x+1}{x+8}$ $=\frac{1}{9}$ **True** **Lie**
Problem 2 $\lim_{x\to 0}\frac{\sqrt{x^2+9}-3}{x^2}$	$\lim_{x\to 0}\frac{\sqrt{x^2+9}-3}{x^2}\cdot\frac{\sqrt{x^2+9}-3}{\sqrt{x^2+9}-3}$ $=\lim_{x\to 0}\frac{x^2+9+9}{x^2\left(\sqrt{x^2+9}-3\right)}$ $=\lim_{x\to 0}\frac{x^2+18}{x^2\left(\sqrt{x^2+9}-3\right)}$ $=\lim_{x\to 0}\frac{18}{\sqrt{x^2+9}-3}$ $=\infty$ **True** **Lie**	$\lim_{x\to 0}\frac{\sqrt{x^2+9}-3}{x^2}\cdot\frac{\sqrt{x^2+9}+3}{\sqrt{x^2+9}+3}$ $=\lim_{x\to 0}\frac{x^2+9-9}{x^2\left(\sqrt{x^2+9}+3\right)}$ $=\lim_{x\to 0}\frac{1}{\sqrt{x^2+9}+3}$ $=\frac{1}{\sqrt{12}}$ **True** **Lie**	$\lim_{x\to 0}\frac{\sqrt{x^2+9}-3}{x^2}\cdot\frac{\sqrt{x^2+9}+3}{\sqrt{x^2+9}+3}$ $=\lim_{x\to 0}\frac{x^2+9-9}{x^2\left(\sqrt{x^2+9}+3\right)}$ $=\lim_{x\to 0}\frac{1}{\sqrt{x^2+9}+3}$ $=\frac{1}{6}$ **True** **Lie**

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Problem 3 $\lim_{x\to 0}\frac{\frac{1}{x+4}-\frac{1}{4}}{x}$	$\lim_{x\to 0}\frac{\frac{4}{4}\cdot\frac{1}{x+4}-\frac{1}{4}\cdot\frac{x+4}{x+4}}{x}$ $=\lim_{x\to 0}\frac{\frac{4}{4(x+4)}-\frac{x+4}{4(x+4)}}{x}$ $=\lim_{x\to 0}\frac{\frac{-x+4}{4(x+4)}}{x}$ $=\lim_{x\to 0}\frac{-x+4}{4(x+4)}\cdot\frac{1}{x}$ $=\lim_{x\to 0}\frac{-x+4}{4(x+4)}\cdot\frac{1}{x}$ $=\text{dne}$ **True** **Lie**	$\lim_{x\to 0}\frac{\frac{4}{4}\cdot\frac{1}{x+4}-\frac{1}{4}\cdot\frac{x+4}{x+4}}{x}$ $=\lim_{x\to 0}\frac{\frac{4}{4(x+4)}-\frac{x+4}{4(x+4)}}{x}$ $=\lim_{x\to 0}\frac{\frac{-x}{4(x+4)}}{x}$ $=\lim_{x\to 0}\frac{-x}{4(x+4)}\cdot\frac{1}{x}$ $=\lim_{x\to 0}\frac{1}{4(x+4)}\cdot\frac{1}{1}$ $=\frac{1}{8}$ **True** **Lie**	$\lim_{x\to 0}\frac{\frac{4}{4}\cdot\frac{1}{x+4}-\frac{1}{4}\cdot\frac{x+4}{x+4}}{x}$ $=\lim_{x\to 0}\frac{\frac{4}{4(x+4)}-\frac{x+4}{4(x+4)}}{x}$ $=\lim_{x\to 0}\frac{\frac{-x}{4(x+4)}}{x}$ $=\lim_{x\to 0}\frac{-x}{4(x+4)}\cdot\frac{1}{x}$ $=\lim_{x\to 0}\frac{-1}{4(x+4)}\cdot\frac{1}{1}$ $=-\frac{1}{16}$ **True** **Lie**
Problem 4 $\lim_{h\to 0}\frac{(3+h)^2-9}{h}$	$\lim_{h\to 0}\frac{9+6h+h^2-9}{h}$ $=\lim_{h\to 0}\frac{6h+h^2}{h}$ $=\lim_{h\to 0}\frac{h(6+h)}{h}$ $=\lim_{h\to 0}(6+h)$ $=6$ **True** **Lie**	$\lim_{h\to 0}\frac{9+h^2-9}{h}$ $=\lim_{h\to 0}\frac{h^2}{h}$ $=\lim_{h\to 0}\frac{1}{h}$ $=\text{dne}$ **True** **Lie**	$\lim_{h\to 0}\frac{9+6h+h^2-9}{h}$ $=\lim_{h\to 0}\frac{6h+h^2}{h}$ $=\lim_{h\to 0}(6h+h)$ $=0$ **True** **Lie**