Avon High School Name ____________________________
AP Calculus AB

Period _____ **Score** ______ / 4

Two Lies and a Truth Activity: Topic 1.6

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 $\lim_{x\to1}\frac{x^3-1}{x^2+7x-8}$	$\lim_{x\to1}\frac{x^3-1}{x^2+7x-8}$ $=\lim_{x\to1}\frac{(x-1)(x-1)(x-1)}{(x-1)(x+8)}$ $=\lim_{x\to1}\frac{(x-1)^2}{x+8}$ $=-\frac{0^2}{9}$ $=0$ True **[Lie]** **The factoring is incorrect for the difference of two cubes.**	$\lim_{x\to1}\frac{x^3-1}{x^2+7x-8}$ $=\lim_{x\to1}\frac{(x-1)(x^2+x+1)}{(x-1)(x+8)}$ $=\lim_{x\to1}\frac{x^2+x+1}{x+8}$ $=\frac{3}{9}$ or $\frac{1}{3}$ **[True]** Lie	$\lim_{x\to1}\frac{x^3-1}{x^2+7x-8}$ $=\lim_{x\to1}\frac{(x-1)(x^2-x+1)}{(x-1)(x+8)}$ $=\lim_{x\to1}\frac{x^2-x+1}{x+8}$ $=\frac{1}{9}$ True **[Lie]** **The factoring is incorrect for the difference of two cubes. The circled sign should be a "plus."**
Problem 2 $\lim_{x\to0}\frac{\sqrt{x^2+9}-3}{x^2}$	$\lim_{x\to0}\frac{\sqrt{x^2+9}-3}{x^2}\cdot\frac{\sqrt{x^2+9}-3}{\sqrt{x^2+9}-3}$ $=\lim_{x\to0}\frac{x^2+9+9}{x^2\left(\sqrt{x^2+9}-3\right)}$ $=\lim_{x\to0}\frac{x^2+18}{x^2\left(\sqrt{x^2+9}-3\right)}$ $=\lim_{x\to0}\frac{18}{\sqrt{x^2+9}-3}$ $=\infty$ True **[Lie]** **The sign of the conjugate is incorrect. It should be a "plus."**	$\lim_{x\to0}\frac{\sqrt{x^2+9}-3}{x^2}\cdot\frac{\sqrt{x^2+9}+3}{\sqrt{x^2+9}+3}$ $=\lim_{x\to0}\frac{x^2+9-9}{x^2\left(\sqrt{x^2+9}+3\right)}$ $=\lim_{x\to0}\frac{1}{\sqrt{x^2+9}+3}$ $=\frac{1}{\sqrt{12}}$ True **[Lie]** **When evaluating the limit, the 3 was misinterpreted as being under the square root.**	$\lim_{x\to0}\frac{\sqrt{x^2+9}-3}{x^2}\cdot\frac{\sqrt{x^2+9}+3}{\sqrt{x^2+9}+3}$ $=\lim_{x\to0}\frac{x^2+9-9}{x^2\left(\sqrt{x^2+9}+3\right)}$ $=\lim_{x\to0}\frac{1}{\sqrt{x^2+9}+3}$ $=\frac{1}{6}$ **[True]** Lie

Problem 3 $\lim_{x\to0}\frac{\frac{1}{x+4}-\frac{1}{4}}{x}$	$\lim_{x\to0}\frac{\frac{4}{4}\cdot\frac{1}{x+4}-\frac{1}{4}\cdot\frac{x+4}{x+4}}{x}$ $=\lim_{x\to0}\frac{\frac{4}{4(x+4)}-\frac{x+4}{4(x+4)}}{x}$ $=\lim_{x\to0}\frac{\frac{-x+4}{4(x+4)}}{x}$ $=\lim_{x\to0}\frac{-x+4}{4(x+4)}\cdot\frac{1}{x}$ $=\lim_{x\to0}\frac{-x+4}{4(x+4)}\cdot\frac{1}{x}$ $=\text{dne}$ True **Lie** **The subtraction sign was not distributed through the numerator.**	$\lim_{x\to0}\frac{\frac{4}{4}\cdot\frac{1}{x+4}-\frac{1}{4}\cdot\frac{x+4}{x+4}}{x}$ $=\lim_{x\to0}\frac{\frac{4}{4(x+4)}-\frac{x+4}{4(x+4)}}{x}$ $=\lim_{x\to0}\frac{\frac{-x}{4(x+4)}}{x}$ $=\lim_{x\to0}\frac{-x}{4(x+4)}\cdot\frac{1}{x}$ $=\lim_{x\to0}\frac{1}{4(x+4)}\cdot\frac{1}{1}$ $=\frac{1}{8}$ True **Lie** **When evaluating the limit, 4 times 4 was incorrectly calculated as 8.**	$\lim_{x\to0}\frac{\frac{4}{4}\cdot\frac{1}{x+4}-\frac{1}{4}\cdot\frac{x+4}{x+4}}{x}$ $=\lim_{x\to0}\frac{\frac{4}{4(x+4)}-\frac{x+4}{4(x+4)}}{x}$ $=\lim_{x\to0}\frac{\frac{-x}{4(x+4)}}{x}$ $=\lim_{x\to0}\frac{-x}{4(x+4)}\cdot\frac{1}{x}$ $=\lim_{x\to0}\frac{-1}{4(x+4)}\cdot\frac{1}{1}$ $=-\frac{1}{16}$ **True** Lie
Problem 4 $\lim_{h\to0}\frac{(3+h)^2-9}{h}$	$\lim_{h\to0}\frac{9+6h+h^2-9}{h}$ $=\lim_{h\to0}\frac{6h+h^2}{h}$ $=\lim_{h\to0}\frac{h(6+h)}{h}$ $=\lim_{h\to0}(6+h)$ $=6$ **True** Lie	$\lim_{h\to0}\frac{9+h^2-9}{h}$ $=\lim_{h\to0}\frac{h^2}{h}$ $=\lim_{h\to0}\frac{1}{h}$ $=\text{dne}$ True **Lie** **The expansion of $(3+h)^2$ is incorrect as it is missing the $6h$ term.**	$\lim_{h\to0}\frac{9+6h+h^2-9}{h}$ $=\lim_{h\to0}\frac{6h+h^2}{h}$ $=\lim_{h\to0}(6h+h)$ $=0$ True **Lie** **The simplification of the second step is incorrect as both h terms in the numerator were not considered.**