

How should you show your work on a quiz or exam?

Problem: $\lim_{x \rightarrow 3^-} \frac{x}{x-3}$

Thought Process: We know the form of this limit is $\frac{3}{0}$.

We know a form of $\frac{\text{non-zero}}{\text{zero}}$ means we have a vertical asymptote. That means our answer is either $+\infty$ or $-\infty$. We need to determine which one by looking at the sign of the expression near 3. When $x < 3$, then $x-3 < 0$ so it is negative. The number on top is positive, so a $\frac{+}{-} \rightarrow -\infty$.

Writing on Exam:

$$\lim_{x \rightarrow 3^-} \frac{x}{x-3} \rightarrow \frac{3}{0^-}$$

← means less than 0, 0 from the left, or negative numbers near 0.

$$\lim_{x \rightarrow 3^-} \frac{x}{x-3} = -\infty$$

Note:

When writing the solution, we Do NOT want to write

$$\lim_{x \rightarrow 3^-} \frac{x}{x-3} = \frac{3}{0}$$

because they are not really equal.

$\frac{3}{0}$ is a form, not a number.

We use an arrow to write "goes to" or "approaches"

You should also use arrows for $\frac{0}{0}$ or $\frac{\infty}{\infty}$ or any other form which is not a number.