Limits Asymptotes Rational Functions

TI PROFESSIONAL DEVELOPMENT   **STUDENT**

1. We are going to investigate what and where the horizontal and vertical asymptotes are for: $$y = \frac{2x + 3}{x - 1.}$$ Notice the decimal point after the '1' in the denominator. This will ensure that the values displayed in the table will be decimals and not fractions.	2. Enter the rational function into y1 but do not graph it. We will analyze the equation first.	3. We will use the **Table Ask** feature and the concept of limits to do so. Press 2nd window and set the Table as shown below: NORMAL FLOAT AUTO REAL RADIAN MP TABLE SETUP TblStart=0 ⊿Tbl=1 Indpnt: Auto **Ask** Depend: **Auto** Ask
4. Type the following values for x in the table as shown below: X=	5. Explain what these 3 points mean in the graph of $$y = \frac{2x + 3}{x - 1.}$$	6. Let's investigate what is occurring 'around' x = 1. First delete the 3 ordered pairs in the table by pressing on del for each x-value. This clears the table. X=
7. Let's first look at values of x that are getting closer and closer to 1, but larger than 1. That is, $\lim\limits_{x \to 1^+} \left(\dfrac{2x + 3}{x - 1.} \right) = ?$	8. Type in the following values for x in the newly empty table. Press enter after each value and notice what is happening with the y-values. $x = 1.1,\ 1.01,\ 1.001,$ $1.0001,\ 1.00001$ 1.000001	9. Continue investigating by typing the following values and press enter after each value. Notice what is happening with the y-values. $x = 1.0000001,\ 1.00000001,$ $1.000000001,\ 1.0000000001$
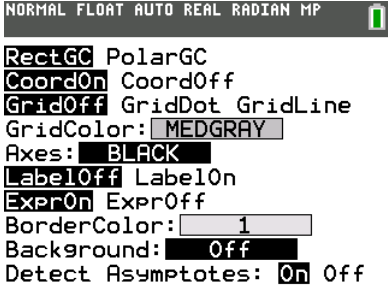
10. Based on the answers to steps 11 and 12, explain what is happening as $x \to 1^+$.	11. Delete these ordered pairs in the table by pressing on $\boxed{\text{del}}$ for each x-value. Let's look at values of x that are close to 1 , but smaller than 1. That is, $\lim\limits_{x \to 1^-}\left(\dfrac{2x + 3}{x - 1.}\right) = ?$	12. Type in the following values for x and press $\boxed{\text{enter}}$ after each value. Notice the y-values. $x = 0.9, \ 0.99, \ 0.999, \ 0.9999$ $0.99999, \ 0.999999, \ 0.9999999$ $0.99999999, \ 0.999999999$
13. Based on the answers to step 15, explain what is happening as $x \to 1^-$.	14. Next we will investigate what is happening as x increases without bound, that is, $\lim\limits_{x \to +\infty}\left(\dfrac{2x + 3}{x - 1.}\right) = ?$	15. Type in the following values for x and press $\boxed{\text{enter}}$ after each value. Notice the y-values. $x = 10, \ 100, \ 1000, \ 10^4,$ $10^5, \ 10^6, \ 10^7, \ 10^8, \ 10^9$ Explain what is happening as $x \to +\infty$.
16. Investigate what is happening as x decreases without bound, that is, $\lim\limits_{x \to -\infty}\left(\dfrac{2x + 3}{x - 1.}\right) = ?$ Type in the following values for x and press $\boxed{\text{enter}}$ after each value. Notice the y-values. $x = -10, \ -100, \ -1000,$ $-10^4, \ -10^5, \ -10^6, \ -10^7$ $-10^8, \ -10^9$	17. Press $\boxed{\text{2nd}}$ $\boxed{\text{zoom}}$ to turn **On** the *Detect Asymptotes* feature. NORMAL FLOAT AUTO REAL RADIAN MP **RectGC** PolarGC **CoordOn** CoordOff **GridOff** GridDot GridLine GridColor: MEDGRAY Axes: BLACK **LabelOff** LabelOn **ExprOn** ExprOff BorderColor: 1 Background: Off Detect Asymptotes: **On** Off Graph the function.	18. Compare the graph to what you discovered in your analysis. a) State the equation of the vertical asymptote and explain what is occurring around it. b) State the equation of the horizontal asymptote and explain what is occurring around it. c) Trace to the x-intercept. d) Trace to y-intercept.