



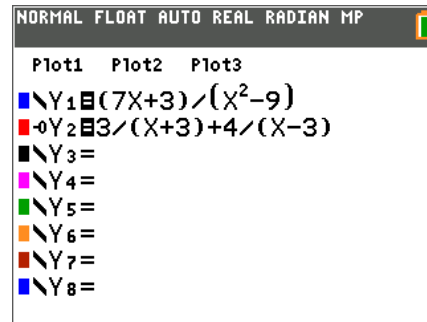
Problem 1 – Introduction

Press $\boxed{Y=}$ and enter the two functions:

$$Y_1 = \frac{7x+3}{x^2-9} \text{ and } Y_2 = \frac{3}{x+3} + \frac{4}{x-3}$$

For the second expression, move the cursor to the left of $Y_2=$ and press $\boxed{\text{enter}}$ to bring up the graphing options screen. Use the down arrow to select **Line:** and use the left or right arrow to choose the **0** option. Arrow down and select OK. This will place a large circle in front of the graph as it is graphed on the handheld.

To view the graphs, press $\boxed{\text{zoom}}$ and select **6:ZStandard**.



1. How do the graphs of the two given equations compare?

2. What do the graphic results tell us about the two functions?

Functions can often be expressed in several different ways. The second representation splits the initial rational function into fractional parts and is referred to as the sum of partial fractions.

3. How are the denominators in $\frac{3}{x+3} + \frac{4}{x-3}$, the partial fractions, related to the denominator of the original expression $\frac{7x+3}{x^2-9}$?

To begin understanding how these partial fractions are developed, begin by writing two fractions using the factors of the denominator of Y_1 . Let A and B represent the numerators yet to be determined.

$$\frac{7x+3}{x^2-9} = \frac{A}{x+3} + \frac{B}{x-3}$$



Breaking Up Is Not Hard To Do

Student Activity

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4. What is the LCD (least common denominator) for $\frac{7x+3}{x^2-9} = \frac{A}{x+3} + \frac{B}{x-3}$?
5. What is the result of multiplying both sides of $\frac{7x+3}{x^2-9} = \frac{A}{x+3} + \frac{B}{x-3}$ by the LCD?
6. Substitute in a convenient number for x and solve for A . What value did you obtain for A ?
7. Similarly substitute in a convenient number for x and solve for B . What value did you obtain for B ?
8. Now substitute the values you found for both A and B into the equation shown in Question 4 to show the equivalent rational function and sum of partial fractions.
9. How do your results for Question 8 support your answer to the Question 2 regarding what the graphs of the functions Y_1 and Y_2 tell us about the two functions?



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Problem 2 – Practice

10. Express the rational function, $(x) = \frac{7x-4}{x^2+x-6}$, as a sum of partial fractions.

11. Graph the initial function and your sum of partial fractions using the graphing calculator as outlined in Problem 1. How does this verify your results? Explain your reasoning.

Problem 3 – The Next Level

12. Express the rational function, $(x) = \frac{5x-7}{4x^2-8x-12}$, as a sum of partial fractions.

13. Graph the initial function and your sum of partial fractions using the graphing calculator. How does this verify your results? Explain your reasoning.



Problem 4 – Additional Practice Problems

Represent each of the following rational functions as a sum of partial fractions. Verify your results graphically.

14. $f(x) = \frac{-7x-11}{x^2+4x+3}$

15. $f(x) = \frac{2x+42}{x^2+2x-24}$

16. $f(x) = \frac{x}{x^2+2x-8}$