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| Given the equation of a rational function, will you always be able to determine the domain? In this activity, you will explore vertical asymptotes and removable discontinuities using the **Transformation Graphing App** on the handheld. |  |

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| **Problem 1**To turn on the **Transformation Graphing** app, press **apps**, **:Transfrm**, and press any key. Press $y=$ and in $Y\_{1}$, type in the equation $Y\_{1}= \frac{C}{(X-A)(X-B)}$. |
| 1. Use the up/down arrows to change between the values of *A, B, and C*. Use the left/right arrows to change each individual value. Change the value of *A.* Describe how the graph changes. |
| 2. Change the value of *B*. Describe how the graph changes. |
| 3. What do the values of *A* and *B* represent in the function? |
| 4. What are the equations of the vertical asymptotes? |
| 5. State the domain of the function in terms of *A*, *B*, and *C*. |
| 6. Change the value of *C*. How does changing *C* affect the domain? |
| 7. Describe how you could find the vertical asymptotes for any rational function with a constant numerator. |
| **Problem 2** |
| 8. For problem 2, type the following equation into $Y\_{1}$, $Y\_{1}= \frac{(X-A)(x-B)}{(X-C)}$. Using the arrows, set *A* = 2 and *B* = –1, and then change the value of *C*. For which values of *C* are there no asymptotes? Explain why there are no asymptotes for these values of *C*. |

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| 9. The “hole” in the graph is called a removable discontinuity. Explain why the hole exists and how you might remove it by modifying the function definition. |
| 10. Answer the following question: |
| The function $f\left(x\right)= \frac{(x+6)(x-3)}{(x+6)}$ has1. an asymptote at x = -6 (b) a removable discontinuity at x = -6

 (c) an asymptote at x = 6 (d) a removable discontinuity at x = 6 (e) continuity **Problem 3** |
| 11. For problem 3, type the following equation into $Y\_{1}$, $Y\_{1}= \frac{(X-A)}{(X-B)(X-C)}$. Using the arrows, set *B* = –1 and *C = 4*, and then change the value of *A*. a. Describe how the graph changes as the value of *A* changes.b. What is the domain of the function in terms of *A*, *B*, and *C*?c. For which values of *A* is there only one asymptote? Describe the graph at these values.d. Explain algebraically why the graph looks as it does at these points. |
| 12. Describe how the domain would change if you changed the values of *B* and *C*. |
| 13. Answer the following question: The function $f\left(x\right)= \frac{(x-3)}{(x+6)(x-3)}$ has1. one asymptote at x = 3 (b) a removable discontinuity at x = 3

 (c) two asymptotes at x = -6 and x = 3 (d) one asymptote at x = -6 (e) continuity |

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| **Problem 4**For problem 4, type the following equation into $Y\_{1}$, $Y\_{1}= \frac{(X+1)^{A}}{(X+1)^{B}}$. Using the arrows, set *B* = –1 and *C = 4*, and then change the value of *A*. |
| 14. Answer the following questions: Holes were discussed in question 9. While manipulating *A* and *B* on your graph, what would *A* and *B* have to be for *f1(x)* to have a hole? 1. If *A* < *B*
2. If *A* = *B*
3. If *A* > *B*

 What would *A* and *B* need to be to have a vertical asymptote? 1. If *A* < *B*
2. If *A* = *B*
3. If *A* > *B*
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