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| The goal of this activity is to help you understand how the graph of a function can be translated vertically (up or down) and horizontally (left or right) by adding to or subtracting from the output or the input. | C:\Users\wilkied\AppData\Local\Temp\Texas Instruments\TI-SmartView CE for the TI-84 Plus Family\Capture1-1667753492563.png |

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| In this activity, the movements of the parent functions and will be explored. You will be using the **Transformation Graphing App** and the program **MOVEIT**, downloaded by your teacher. First, access the App by pressing **apps** and selecting **Transfrm**. Press any key to start. You will now access the **MOVEIT** program by pressing **prgm**. If you are using a TI-84 Plus CE without Python, you will select **MOVEIT**. If you are using a TI-84 Plus CE with Python, you will press  **1: TI-Basic** and then select **MOVEIT**. On the Home screen, two options will appear. Option 1 will graph the parent function and option 2 will graph . Press **2nd [quit]** to exit a graph. Press **enter** immediately to run the program again. For each problem in this activity, look at the transformation of both types of functions.  C:\Users\wilkied\AppData\Local\Temp\Texas Instruments\TI-SmartView CE for the TI-84 Plus Family\Capture1-1667786111046.png C:\Users\wilkied\AppData\Local\Temp\Texas Instruments\TI-SmartView CE for the TI-84 Plus Family\Capture2-1667786141089.png C:\Users\wilkied\AppData\Local\Temp\Texas Instruments\TI-SmartView CE for the TI-84 Plus Family\Capture3-1667786186949.png  **Problem 1 –**  Use the left and right arrow keys to change the value of **B only**. Leave C = 0. You will need to first determine the value of B in each question.  Let’s see what you remember about transforming **:**  In questions **1** and **2**, describe the transformation for each graph as compared to the graph of the parent function , use your handheld to verify your answer.  1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  3. In general, describe the transformation of and explain your reasoning.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  **Problem 2 –**  Use the up and down arrow keys to toggle to **C** and then the left and right arrow keys to change the  value of **C only**. Leave B = 0.  Let’s see what you remember about transforming **:**  In questions **4** and **5**, describe the transformation for each graph as compared to the graph of the  parent function , use your handheld to verify your answer.  4. The graph of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  5. The graph of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  6. In general, describe the transformation of and explain your reasoning.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  **Problem 3 –**  7. Describe the transformations of as compared to the parent function .    \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  8. In general, describe the transformations of  when:  *b* and *c* are both positive \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  *b* and *c* are both negative \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  *b* is positive and *c* is negative \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  *b* is negative and *c* is positive \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  **Problem 4 –**  In order to transform your function through the multiplication of *a*, press **Y =** and enter **AX2** next to Y1 and **AX3** next to Y2. Press **enter** on the **=** sign to choose the function you want to graph. Press **graph** to explore the transformations.  9. Describe the transformation of as compared to the parent function .    \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  With a classmate, create a table of values comparing the y-values for given x-values for the functions and . For example, when *x = 2*, the corresponding values for the functions are 4 and 2 respectively. In other words, the y-values are “pushed lower” as a result of multiplying by 0.5. This is known as a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  10. Describe the transformation of as compared to the parent function .  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  11. In general, describe the transformation when for the graph of as compared to  the parent function .  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  12. In general, describe the transformation when for the graph of as compared to the  parent function .  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  13. Change the coefficient of the quadratic and cubic functions to -0.5 and then to -2. Describe the  graph of when *a* is negative as compared to when *a* is positive.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  **Problem 5 –**  In order to transform your function through the multiplication of *a*, press **Y =** and enter **(AX)2** next to Y1 and **(AX)3** next to Y2. Press **enter** on the **=** sign to choose the function you want to graph. Press **graph** to explore the transformations.  14. Describe the transformation of as compared to the parent function .    \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  With a classmate, create a table of values comparing the y-values for given x-values for the functions and . For example, when *x = 2*, the corresponding values for the functions are 4 and 16 respectively. In other words, instead of it taking x = 4 to get y = 16, it took x = 2 to get y = 16, therefore x-values are “pushed lower” as a result of multiplying the x-value by 2 or the x-value was halved. This is known as a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  15. Describe the transformation of as compared to the parent function .  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  16. In general, describe the transformation when for the graph of as compared to  the parent function .  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  17. In general, describe the transformation when for the graph of as compared to the  parent function .  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  18. Change the sign of the value being multiplied by *x* for the quadratic and cubic functions to -0.5  and then to -2. Describe the graph of when *a* is negative as compared to when *a* is  positive.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  **Further IB Applications**  The following diagram shows the graph of the function , for . The points (-5, 4) and (0, 3) both lie on the graph of . There is a minimum at point (-2, -1).    Let .  (a) Write down the domain of . \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  (b) Write down the range of . \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  (c) On the graph above, sketch the graph of .  Let .  (d) Describe the transformations of as compared to .  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |