**Activity 4.1.2 – Evaluating and Graphing for *n* a**

**Natural Number**

**Indirect Variation**: If the product of two variables equals a constant the variables are *indirectly related*. Variables *x* and *y* are indirectly related if they satisfy the equation for some constant *k*. When we solve for *y*, we get or .

To investigate the effect *k* has on the graph of we will use the graphing calculator and the *Transform* application.

Follow the steps below:

* Press APPS and choose Transfrm.
* In Y1 enter .
* Set the window to the ZStandard by pressing ZOOM 6
* Press WINDOW and key cursor over to SETTINGS: Set A = 3 and Step = 1.
* Press Graph
* Use the left and right arrow keys to investigate how the change in A affects the graph.

1. When A is positive what quadrants will the graph appear?
2. When A is negative what quadrants will the graph appear?
3. As increases what happens to *y*?
4. As decreases what happens to *y*?
5. What happens when *k* = 0?
6. Does this graph model an inverse (indirect) variation graph? Why or why not?
7. Fill in the tables using the table feature.

A = 3 A = -20 A = 30

|  |  |
| --- | --- |
| *x* | *y* |
| -1 |  |
| -.5 |  |
| 0 |  |
| .5 |  |
| 1 |  |

|  |  |
| --- | --- |
| *x* | *y* |
| -1 |  |
| -.5 |  |
| 0 |  |
| .5 |  |
| 1 |  |

|  |  |
| --- | --- |
| *x* | *y* |
| -1 |  |
| -.5 |  |
| 0 |  |
| .5 |  |
| 1 |  |

Let’s continue to investigate how increasing the absolute value of A – increasing – affects the graph of .

1. Sketch the graph of .
2. When A is positive: b) When A is negative:

Next, we will investigate how the value of *n* affects the graph of .

* In Y1 enter
* Set the window to the ZStandard by pressing ZOOM 6
* Press WINDOW and cursor over to SETTINGS: Set A = 3, B = 1 Step = 1.
* Press Graph
* Use the right arrow key to investigate how the change in B affects the graph (B is even and odd.)

1. What do you notice?
2. Next Set B to 4 and use the left and right arrow keys to see what happens when A is positive and when A is negative. What do you notice?
3. Set B to 5 and use the left and right arrow keys to see what happens when A is positive and when A is negative. What do you notice?
4. Let’s summarize using the equation of the form. In the graphing calculator we substituted A for *k* and B for *n*.
5. If *n* is even and *k* is positive what quadrants will the graph appear?
6. If *n* is odd and *k* is positive what quadrants will the graph appear?
7. If *n* is even and *k* is negative what quadrants will the graph appear?
8. If *n* is odd and *k* is negative what quadrants will the graph appear?
9. As increases what happens to *y*?
10. As decreases what happens to *y*?
11. What happens if *n* = 0?
12. What type of graph do you have?
13. Sketch the graph of when:
14. *k* is positive and *n* is odd: b) *k* is negative and *n* is odd:

 

1. *k* is positive and *n* is even: b) *k* is negative and *n* is even

 

1. Use your calculator to sketch the following graphs. Make sure you uninstall the Transfrm app prior to graphing the functions.

|  |  |  |
| --- | --- | --- |
| a)    Domain:  Range:  End behavior: | b)    Domain:  Range:  End behavior: | c)    Domain:  Range:  End behavior: |

|  |  |  |
| --- | --- | --- |
| d)    Domain:  Range:  End behavior: | e)    Domain:  Range:  End behavior: | f)    Domain:  Range:  End behavior: |

**Review Problems**

Simplify the following expressions containing negative exponents. Express the final result using only positive exponents.

1. 2. 3.

4. 5. 6.

7. 8. 9.