**Activity 1.7.2 Inverses of Power Functions**

In this activity we will explore the behavior of inverse functions. We will start with the function $f\left(x\right)=x^{2}$ and will consider only positive inputs.

1. Complete the table of values below for the function $f\left(x\right)=x^{2}$.

|  |  |
| --- | --- |
| Input, *x* | Output, $f\left(x\right)$ |
| 0 |  |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |

1. Based on your table from Question 1, find the table for the inverse of $f\left(x\right)$. (Use the procedure that was introduced in Activity 1.6.1).

|  |  |
| --- | --- |
| Input | Output |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

1. Does the table in Question 2 represent a function? Explain why or why not.
2. Sketch a graph of the function $f\left(x\right)$ and the inverse on the coordinate plane below.



Now let’s consider the function $g\left(x\right)=x^{3}$.

1. Complete the table of values below for the function $g\left(x\right)=x^{3}$.

|  |  |
| --- | --- |
| Input, *x* | Output, $g\left(x\right)$ |
| 0 |  |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |

1. Based on your table from Question 5, find the table for the inverse of $g\left(x\right)$.

|  |  |
| --- | --- |
| Input | Output |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

1. Does the table in Question 6 represent a function? Explain why or why not.
2. Sketch a graph of the function $f\left(x\right)$ and the inverse on the coordinate plane below.



In Questions 1 – 8, you used only positive values for inputs. What happens if you use negative values? Let’s repeat Questions 1 – 8 but using negative values as inputs.

1. Complete the table of values below for the function $f\left(x\right)=x^{2}$.

|  |  |
| --- | --- |
| Input, *x* | Output, $f\left(x\right)$ |
| -4 |  |
| -3 |  |
| -2 |  |
| -1 |  |
| 0 |  |

1. Based on your table from Question 9, find the table for the inverse of $f\left(x\right)$. (Use the procedure that was introduced in Activity 1.6.1).

|  |  |
| --- | --- |
| Input | Output |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

1. Does the table in Question 10 represent a function? Explain why or why not.
2. Sketch a graph of the function $f\left(x\right)$ and the inverse on the coordinate plane below.



Now let’s consider negative inputs for the function $g\left(x\right)=x^{3}$.

1. Complete the table of values below for the function $g\left(x\right)=x^{3}$.

|  |  |
| --- | --- |
| Input, *x* | Output, $g\left(x\right)$ |
| -4 |  |
| -3 |  |
| -2 |  |
| -1 |  |
| 0 |  |

1. Based on your table from Question 13, find the table for the inverse of $g\left(x\right)$.

|  |  |
| --- | --- |
| Input | Output |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

1. Does the table in Question 14 represent a function? Explain why or why not.
2. Sketch a graph of the function $f\left(x\right)$ and the inverse on the coordinate plane below.



Let’s now put this all together.

1. Look at your tables and graphs from Questions 1 – 4 and 9 – 12. Does the function $f\left(x\right)=x^{2}$ have an inverse if we allow both positive and negative inputs? Explain why or why not.
2. Look at your tables and graphs from Questions 5 – 8 and 13 – 16. Does the function $g\left(x\right)=x^{3}$ have an inverse if we allow both positive and negative inputs? Explain why or why not.
3. If we restrict the domain of $f\left(x\right)=x^{2}$ to *x* ≥ 0, then there is an inverse for $f\left(x\right).$ Write a formula for the inverse function:

$f^{-1}\left(x\right)=$

1. There is an inverse for the function $g(x)=x^{3}$ with no restriction on the domain. Write a formula for the inverse function:

$g^{-1}\left(x\right)=$