Transformations of Functions

**Formula Sheet**

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| **Name** | **Definition** | **Formula** |
| Parent Function | A parent function is a function without transformations and is the most basic form of a function. |  |
| Vertical Reflection | A vertical reflection is a reflection over the *x-*axis, or a flip over the *x-*axis. | Equation Rule:  Coordinate Rule: |
| Horizontal Reflection | A horizontal reflection is a reflection over the *y*-axis, or a flip over the *y*-axis. | Equation Rule:  Coordinate Rule: |
| Reflection about the Origin | When a reflection occurs over both the *x*- and *y-*axes, it is called a reflection about the origin, which has the coordinates (0, 0). | Equation Rule:  Coordinate Rule: |
| Vertical Shift | A vertical shift is a translation that shifts the graph of a function vertically, up or down. | Equation Rule:  Coordinate Rule:   |  |  |  | | --- | --- | --- | |  | ***Shift Up*** | ***Shift Down*** | | ***Equation*** |  |  | | ***Coordinate*** |  |  | |
| Horizontal Shift | A horizontal shift is a translation that shifts the graph of a function horizontally, left or right. | Rule:   |  |  |  | | --- | --- | --- | |  | ***Shift Left*** | ***Shift Right*** | | ***Equation*** |  |  | |
| Vertical Dilation | A vertical dilation stretches or compresses the graph of a function vertically. | Equation Rule:  Coordinate Rule:   * ; vertical stretch by a factor of *k* units. * ; vertical compression by a factor of *k* units. |
| Horizontal Dilation | A horizontal dilation stretches or compresses the graph of a function horizontally. | Rule:   * ; horizontal stretch by a factor of *k* units. * ; horizontal compression by a factor of *k* units. |
| Calculate *k* factor | The exact value of k may be determined by comparing two points on the graph. | Compare a point from the original graph and the transformed graph with the same *y-*value. |
| Even Function | Even functions return the same expression for both *x* and *–x*. The output, or *y-*value, will be the same if the *x*-value is positive or negative. | is an even function when   * In a table, the and values are identical * On a graph, the reflection is symmetric about the *y*-axis |
| Odd Functions | Odd functions are symmetric when reflected about the origin. | is an odd function when |