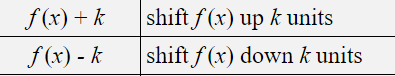
Vertical Translations of Linear Functions Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Period\_\_\_\_\_

**The Rule for Vertical Translations:**

A **linear function** has a graph that is a straight line. The simplest linear function is *f(x)* = *x*. The graph is a line that has a *y*-intercept (the point at which the *y*-axis and the graph intersect) at the origin (0,0) and has a slope of 1. In slope-intercept form, the function would be *f(x)* = 1*x* + 0.

All other linear functions can be created by using a **transformation** (translation, reflection, and stretching) on the **parent** function *f(x)* = *x*. The notation for transformation is to rename the function after the transformation and then tell how the transformation happened. For example, *g(x)* = *f(x)* + 1 means the function *f(x)* moves up one spot and becomes the function named *g(x)*.

If y = f(x), then y = f(x) + k gives a vertical translation. The translation k moves the graph upward when k is a postive value and downward when k is negative value.



**What Is Translation?**

When translating a function *f(x)*, you can move the function vertically along the *y*-axis. A translation that moves a function vertically is denoted outside of the function notation. **For example**, the translation *f(x)* + 3 will move the function up three places. A vertical change moves according to the directions. A vertical change of *f(x)* + 7 moves the function *f(x)* up seven places.

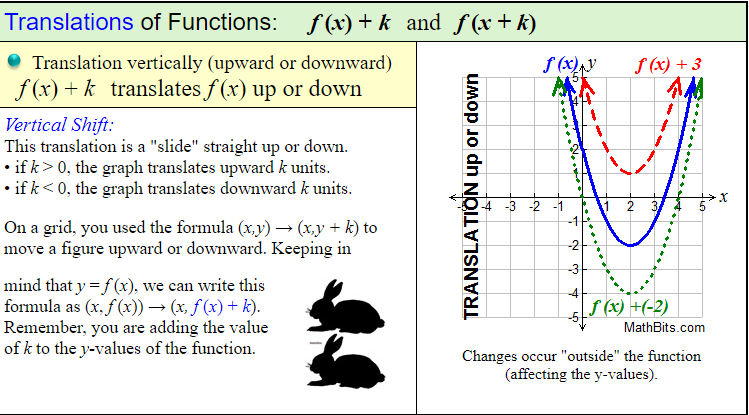
### **Example**

Let's take a look at an example of translation:

Translate the function *f(x)* = 4*x* - 7 five places down to create g(x).

The new function will look like:

* g(x) = 4x – 12



Practice:

|  |  |  |
| --- | --- | --- |
| 1. | F(x) = x + 3  Translate f(x) down 5 units. Write the transformed function in terms of g(x) and then graph both on the right. |  |
| 2. | f(x) = 4x ‐ 3  Translate the graph 2 up. Write the transformed function in terms of g(x) and then graph both on the right |  |
| 3. | f(x) = 2x – 3  Tranlate f(x) down 2 units. Write the transformed function in terms of g(x) and then graph both on the right. |  |
| 4. | Let f(x) = 3x – 2.  Use the given function to describe the listed transformations. Then, write the equation p(x) of the transformed function.   1. f(x) – 7 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 2. f(x) + 8 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 3. F(x) + 1 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | |
| 5. |  | |
| 6. |  | |
| 7. |  | |
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