*The Transformation/ Translations Cheat Sheet*

Translations slide and Transformations change

**Translations**

* *f*(*x*) + *a* is *f*(*x*) shifted upward *a* units
* *f*(*x*) – *a* is *f*(*x*) shifted downward *a* units
* *f*(*x* + *a*) is *f*(*x*) shifted left *a* units
* *f*(*x* – *a*) is *f*(*x*) shifted right *a* units
* –*f*(*x*) is *f*(*x*) flipped upside down ("reflected about the *x*-axis")
* *f*(–*x*) is the mirror of *f*(*x*) ("reflected about the *y*-axis")

**Transform**

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*f*(*ax*) stretches/compresses *f* (*x*) horizontally

f(3x) compresses f(1/3x) stretches

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*a f*(*x*) stretches/compresses *f* (*x*) vertically

2 f(x) stretches ½ f(x) compresses