**1-2: Transformations Sheet f(x) =** $a∙f\left(b\left(x-h\right)\right)+k$

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| |a| | Vertical Stretch:Vertical Compression:**4f(x):** | If a > 1, then vertical stretch by factor of **a**If 0 < a < 1, then vertical compression by factor of **a**y-coordinates stay the same, affects the x-coordinates**Point notation:** **(x, y)** $\rightarrow $ **(x, ay) OR (x, f(x))** $\rightarrow $**(x, a**$∙$**f(x))** |
| -a | Reflection across x-axis**-f(x):** | x-coordinates stay the same, affects y-coordinates**(x, y)** $\rightarrow $ **(x, -y) OR (x, f(x))** $\rightarrow $ **(x, -f(x))** |
| |b| | Horizontal Stretch:Horizontal Compression:**f(4x):** | If 0 < b < 1, then horizontal stretch by factor of **1/b**If b > 1, then horizontal compression by factor of **1/b**y-coordinates stay the same, affects the x-coordinates**(x, y)** $\rightarrow \left(\frac{1}{b}x, y\right)$ **OR (x, f(x))** $\rightarrow $$\left(\frac{1}{b}x, f\left(bx\right)\right)$ |
| -b | Reflection across y-axis**f(-x):** | y-coordinates stay the same, affects x-coordinates**(x, y)** $\rightarrow $ **(-x, y) OR (x, f(x))** $\rightarrow $**(-x, f(-x))** |
| h | Horizontal Translation**f(x-3):** | y-coordinates stay the same, affects x-coordinatesf(x + h):-graph moves left-subtract h from the x-coordinates**(x, y)** $\rightarrow $ **(x – h, y) OR (x, f(x))** $\rightarrow $**(x – h, f(x + h))**f(x – h):-graph moves right-add h to the x-coordinates**(x, y)** $\rightarrow $$(x+h, y)$ **OR (x, f(x))** $\rightarrow $ **(x + h, f(x – h))** |
| k | Vertical Translation**f(x)-3:** | x-coordinates stay the same, affects y-coordinatesf(x) + k: -graph moves up-add k to the y-coordinates**(x, y)** $\rightarrow $ **(x, y + k) OR (x, f(x))** $\rightarrow $ **(x, f(x) + k)**f(x) – k: -graphs moves down-subtract k from the y-coordinates**(x, y)** $\rightarrow $ **(x, y – k) OR (x, f(x))** $\rightarrow $ **(x, f(x) – k)** |