lulumath

Another Transformations of Functions Problem - An Absolute Value Example

Video Notes

Video Link

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Background Knowledge:

- Transformations of Functions Parts I - IV

Reminder: $y = af(K(x-d)) + c$ ← Function Rule

- a: vertical stretch ($|a|>1$) or compression ($0<|a|<1$); vertical reflection (reflection in x-axis) ($a<0$ → negative)
- K: horizontal stretch ($|\frac{1}{K}|>1$) or compression ($0<|\frac{1}{K}|<1$); horizontal reflection (reflection in y-axis) ($K<0$ → negative); Scale factor = $1/K$
- d: Horizontal translation — $d>0$ → shifts right; $d<0$ → shifts left
- c: vertical translation — $c>0$ → shifts up; $c<0$ → shifts down

SO IMPORTANT!!!!!! K MUST be factored out!

Consider the function, $h(x) = -2\left|\frac{1}{4}x - 1\right| - 6$. Determine the parent function and describe the transformations done to the parent function to result in $h(x)$. Graph the function.

$h(x) = -2\left|\frac{1}{4}x - 1\right| - 6$

* Factor K out

$h(x) = -2\left|\frac{1}{4}(x-4)\right| - 6$

Parent function: $f(x) = |x|$

$(x, y) \rightarrow (\frac{1}{K}x + d, ay + c)$

- $a = -2$ ↔ vertical stretch, s.f. = 2 ↔ vertical reflection (in x-axis)
- $K = \frac{1}{4}$, s.f. = 4 → horizontal stretch
- $d = 4$ → horizontal translation 4 units right
- $c = -6$ → vertical translation 6 units down

x	f(x)
-3	3
-2	2
-1	1
0	0
1	1
2	2
3	3

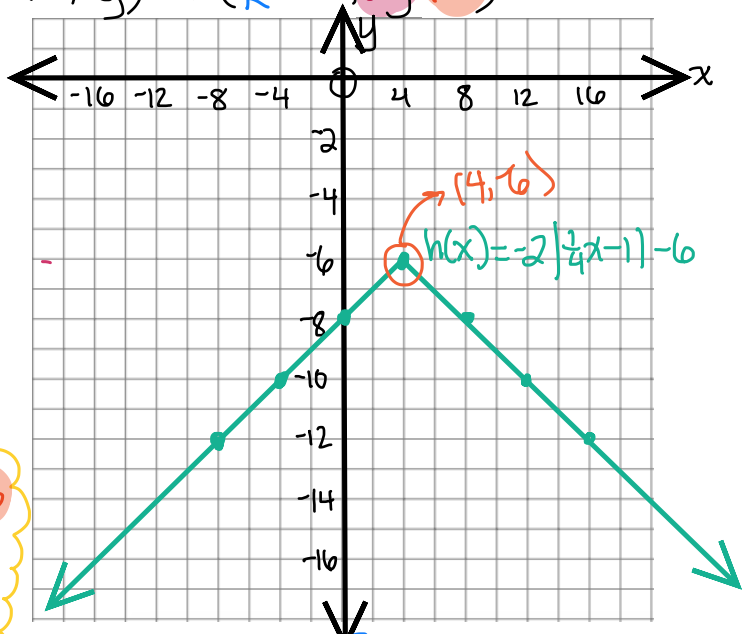
Dilations: Multiply x by 4; Multiply y by -2

4x	-2y
-12	-6
-8	-4
-4	-2
0	0
4	-2
8	-4
12	-6

Translations: Add 4 to x; Subtract 6 from y

h(x)

4x+4	-2y-6
-8	-12
-4	-10
0	-8
4	-6
8	-8
12	-10
16	-12



Domain: $\{x \in \mathbb{R}\}$ or $(-\infty, \infty)$

Range: $\{y \in \mathbb{R} \mid y \leq -6\}$ or $(-\infty, -6]$