Graph Transformations Summary

Start with f

- affects output → Vertical → intuitive
- affects input → Horizontal → counter intuitive

	Vertical	Horizontal
Shift	shift up by k: $f(x) + k$ shift down by k: $f(x) - k$	shift left by h: $f(x+h)$ shift right by h: $f(x-h)$
Scaling	stretch away from x-axis by a factor of c: $c \cdot f(x)$ compress toward the x-axis by a factor of c: $\frac{f(x)}{c}$	stretch away from y-axis by a factor of c: $f\left(\frac{x}{c}\right)$ compress toward the y-axis by a factor of c: $f(c \cdot x)$
Reflecting	reflect over the x-axis: $-f(x)$	reflect over the y-axis: $f(-x)$

- old y = old x
- new x = old x
- new y = old y

⇓

new y = new x

Ex $f(x) = 3\sqrt{2x+5} + 2$

$\sqrt{x}$ → (1,1)

1) stretch away from the x-axis by a factor of 3
2) shift up by 2
3) shift ~~right~~ left by 5
4) compression toward y-axis by a factor of 2

□ (1,1) → (1,3) → (1,5) → (-4,5) → (-2,5)

* (4,2) → (4,6) → (4,3) → (-1,8) → $(-\frac{1}{2}, 8)$