

# Transformations of Functions

## TIPS & TRICKS

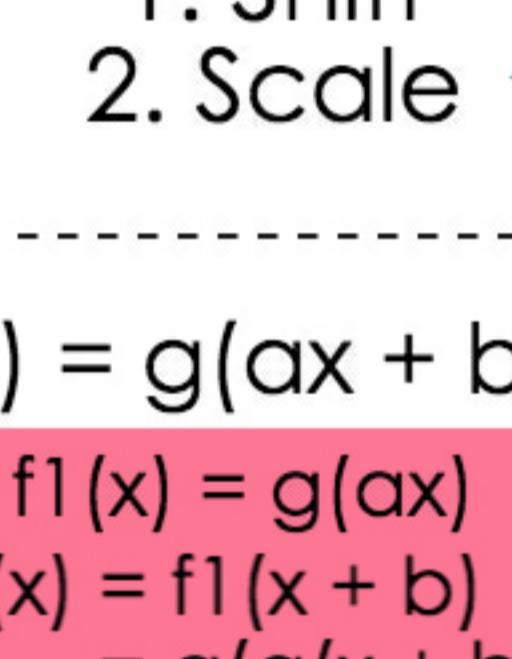
#1

Ordering Rules to Live By

shift: left, right, up, down

scale: stretch, shrink, reflect

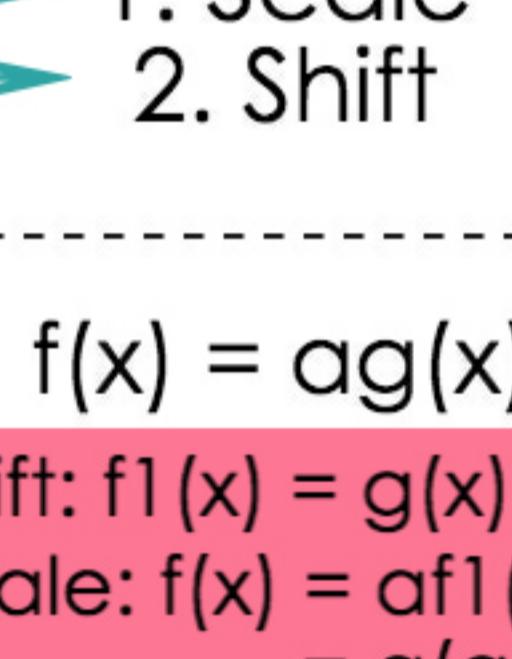
Horizontal



1. Shift  
2. Scale

VS

Vertical



1. Scale  
2. Shift

$$f(x) = g(ax + b)$$

1. Scale:  $f_1(x) = g(ax)$   
2. Shift:  $f(x) = f_1(x + b) = g(a(x + b)) = g(ax + ab)$

1. Shift:  $f_1(x) = g(x + b)$   
2. Scale:  $f(x) = f_1(ax) = g((ax)+b) = g(ax + b)$

WHY



$$f(x) = ag(x) + b$$

1. Shift:  $f_1(x) = g(x) + b$   
2. Scale:  $f(x) = af_1(x) = a(g(x) + b) = ag(x) + ab$

1. Scale:  $f_1(x) = ag(x)$   
2. Shift:  $f(x) = f_1(x) + b = (ag(x)) + b = ag(x) + b$

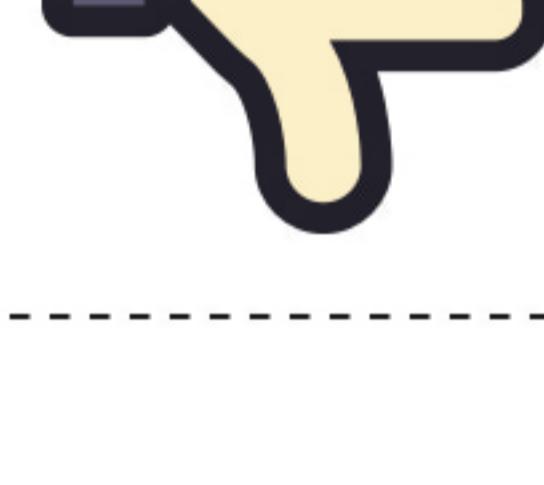
#2

Do's & Don'ts

DO

- transform horizontally, then vertically
- transform vertically, then horizontally

- transform some vertical, then some horizontal, then back to vertical, then back to horizontal—whatever! just...



DON'T

← violate #1 ordering rules!!!



#3

Reminders

X

horizontal transformations are weird

ADD

- b →

+ b ←

MULTIPLY

↑  
↓

a



Quick Note:

scaling transformations can be done in any order!

stretch shrink reflect