# Intro video: Section 1.3
# Transformations of Functions

Math F251X Fall 2020

SCALING
do these first

$f(x)$

SHIFTING
do these next

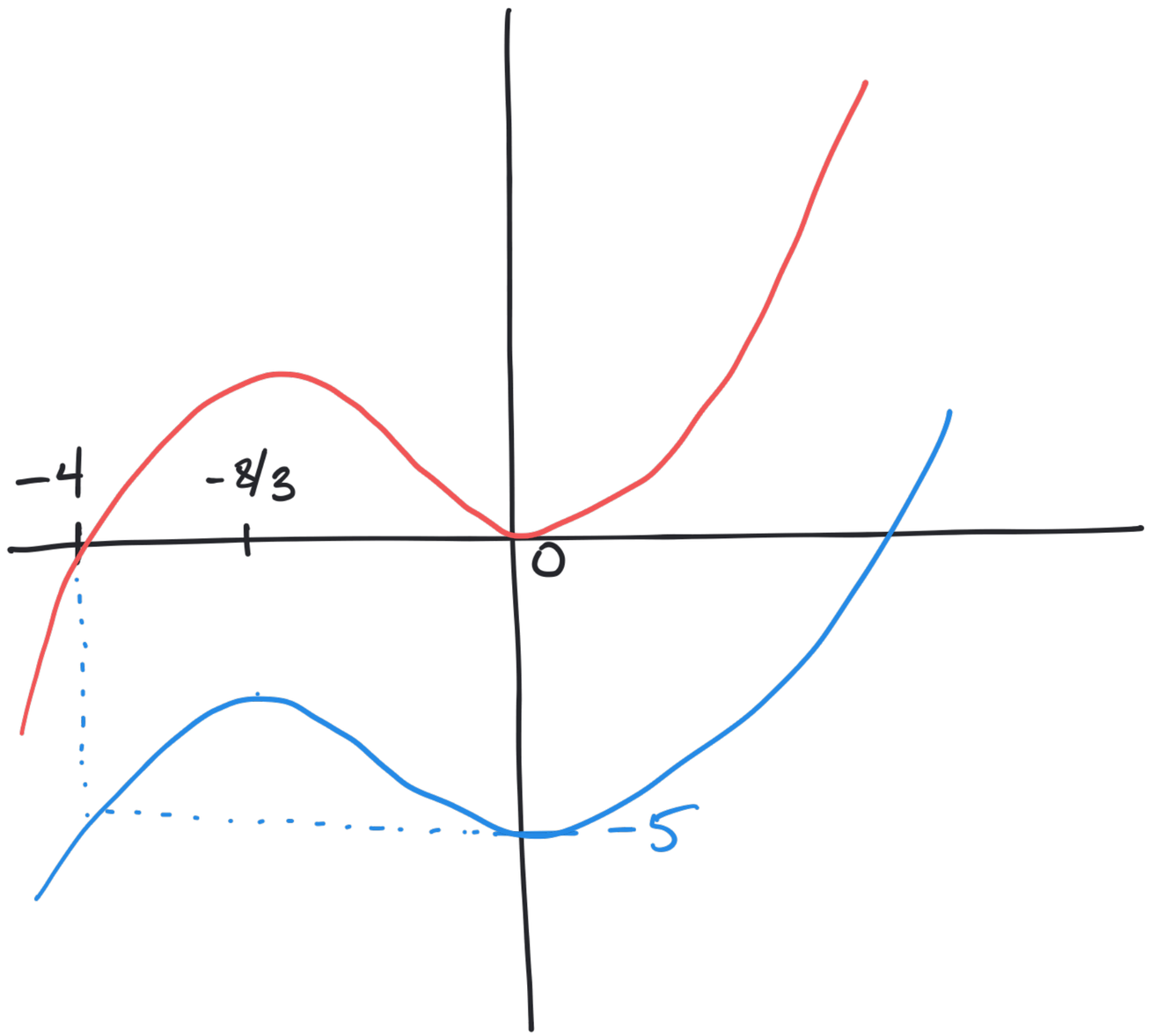
$$\square\, f(\square\, x + \square) + \square$$

inside the function

outside the function

move the graph

$$f(x) \longrightarrow f(x) + c$$

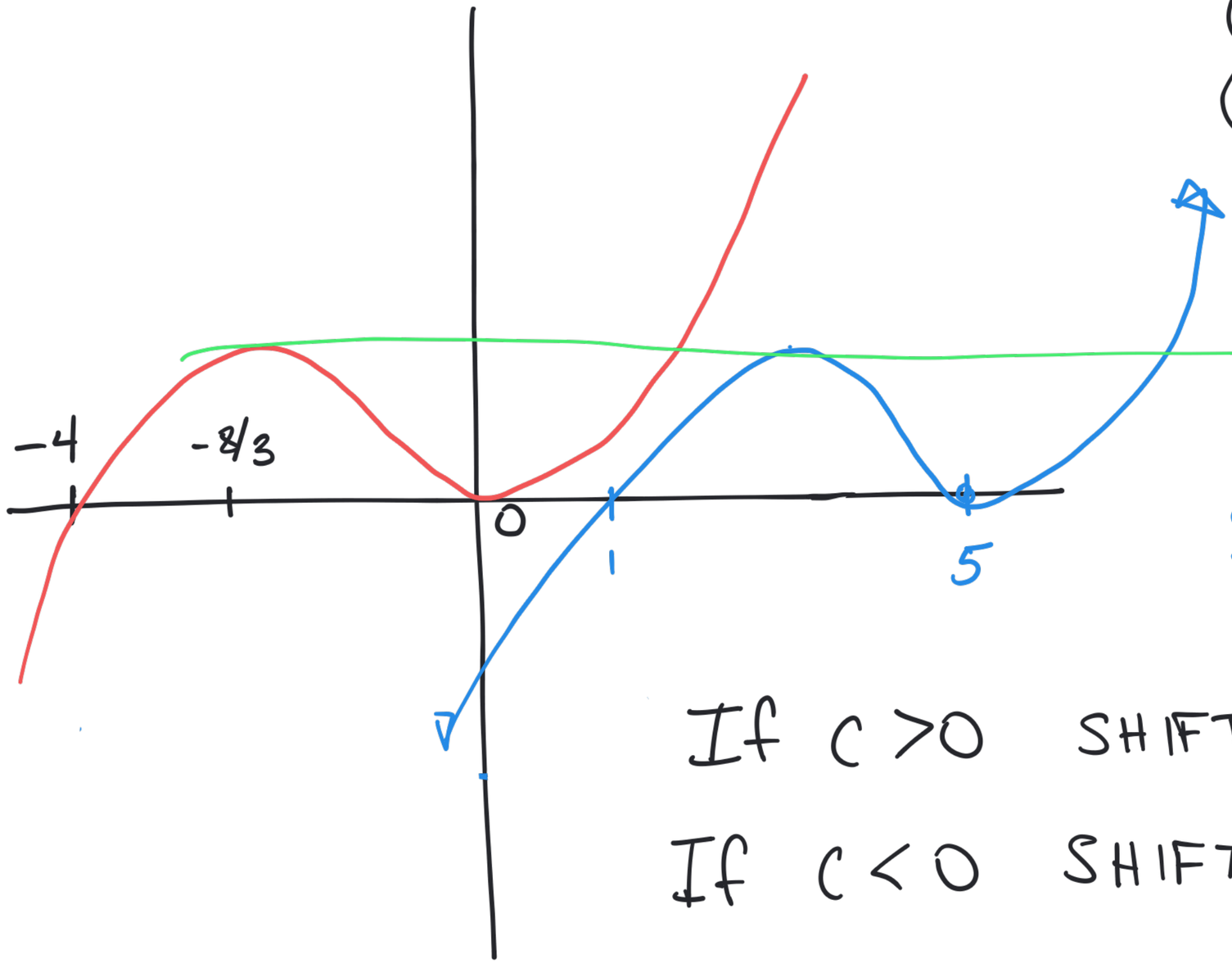



Shift ↑ if $c > 0$

Shift ↓ if $c < 0$

$C = -5$

$$f(x) \longrightarrow f(x - c)$$



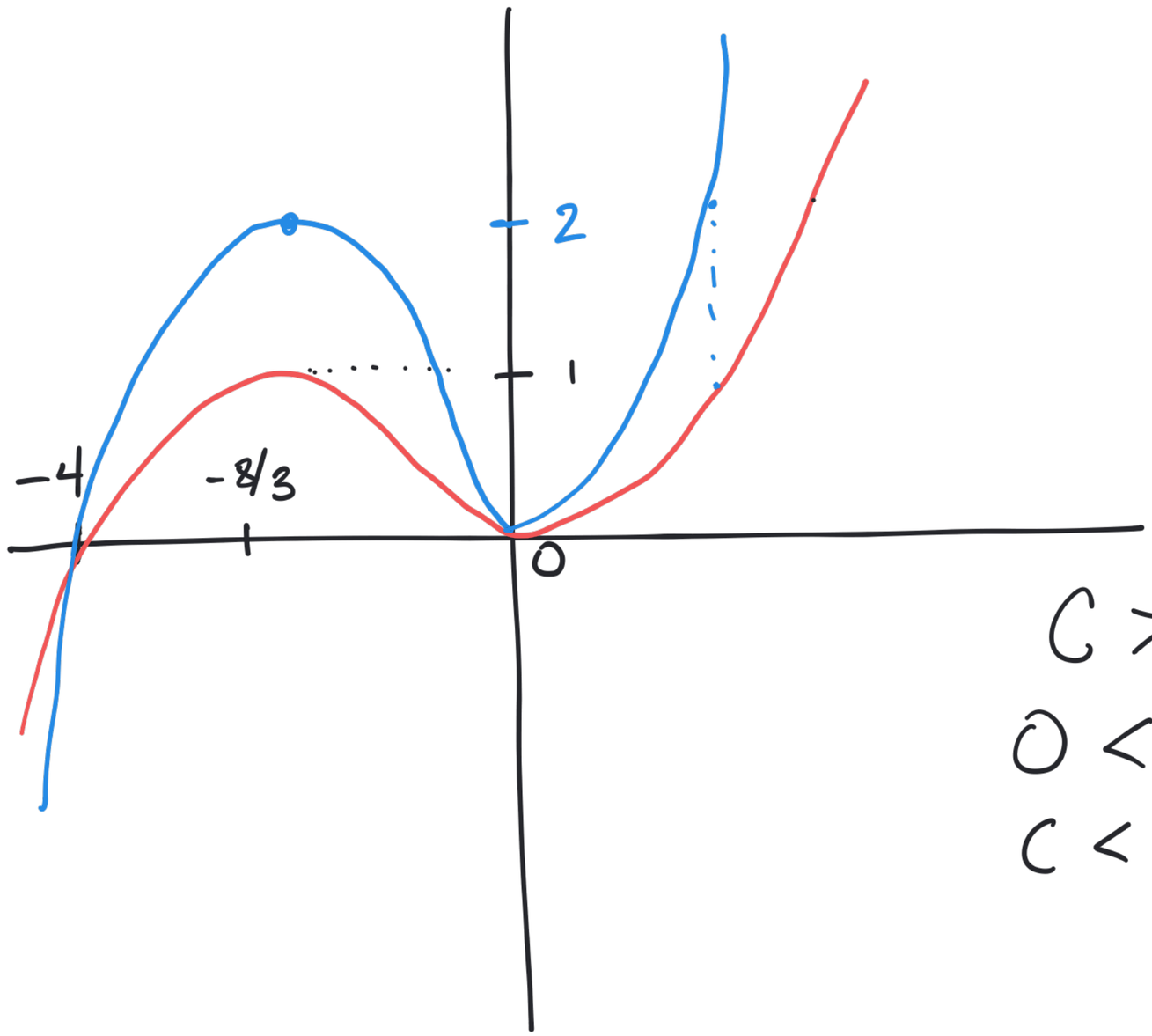

old behavior at 0 is new behavior at c

Say $c = -5$

If $c > 0$ SHIFT ←

If $c < 0$ SHIFT →

$$f(x) \longrightarrow c\,f(x)$$



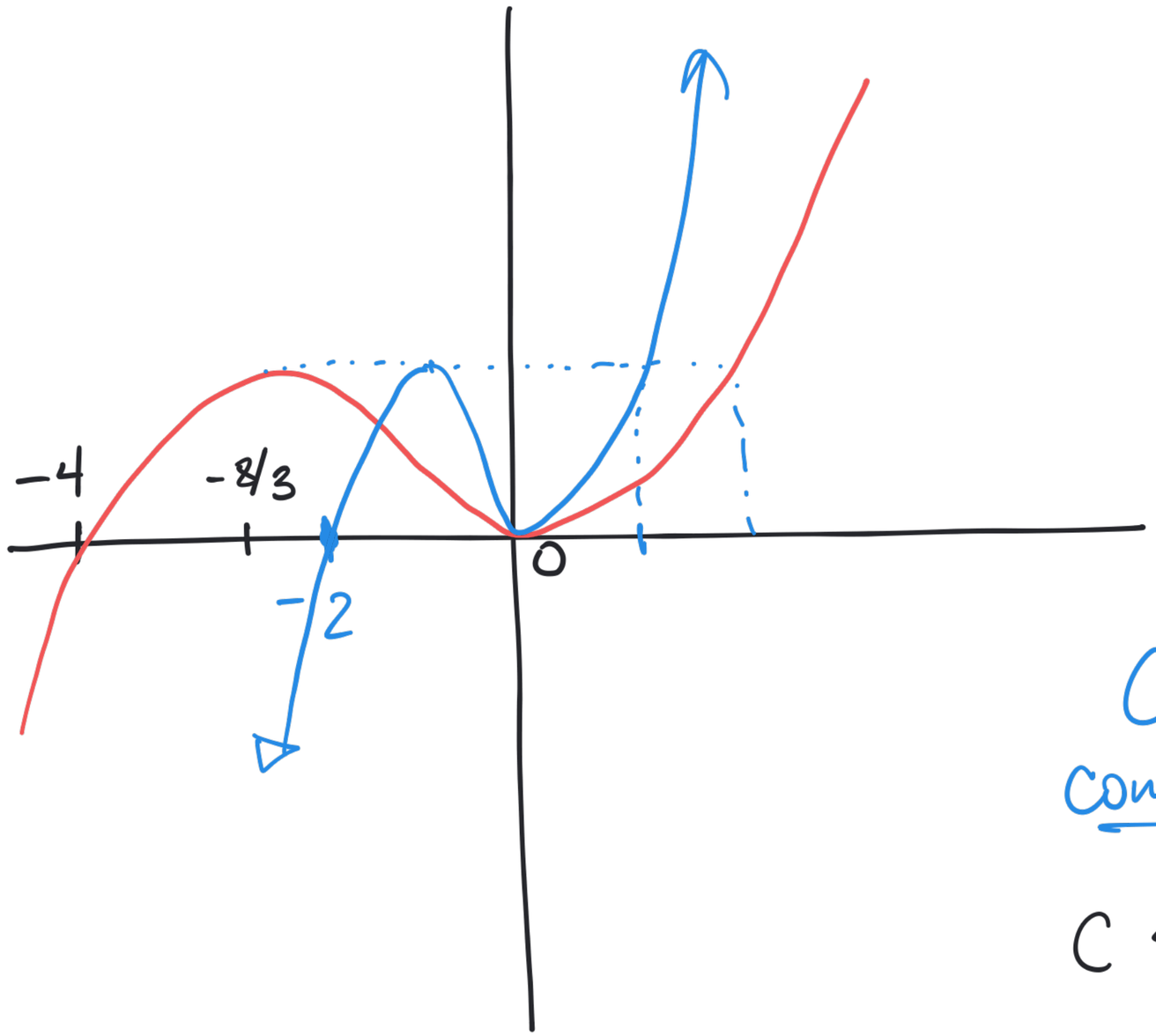

$C = 2$

$C > 1$ : stretch ↕

$0 < C < 1$ : compress ↕

$C < 0$ : flip over x-axis and then stretch ↕

$f(x) \longrightarrow f(cx)$

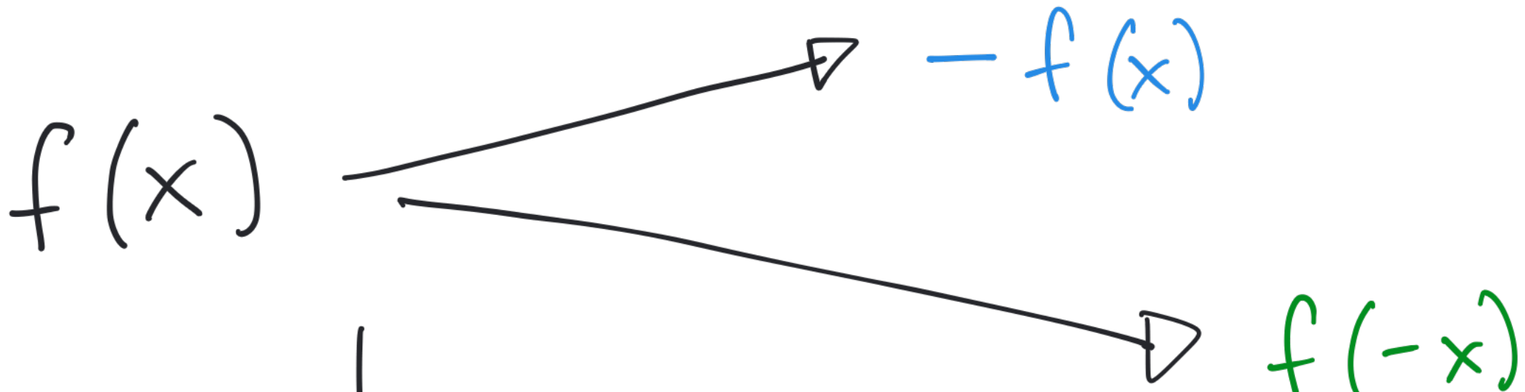


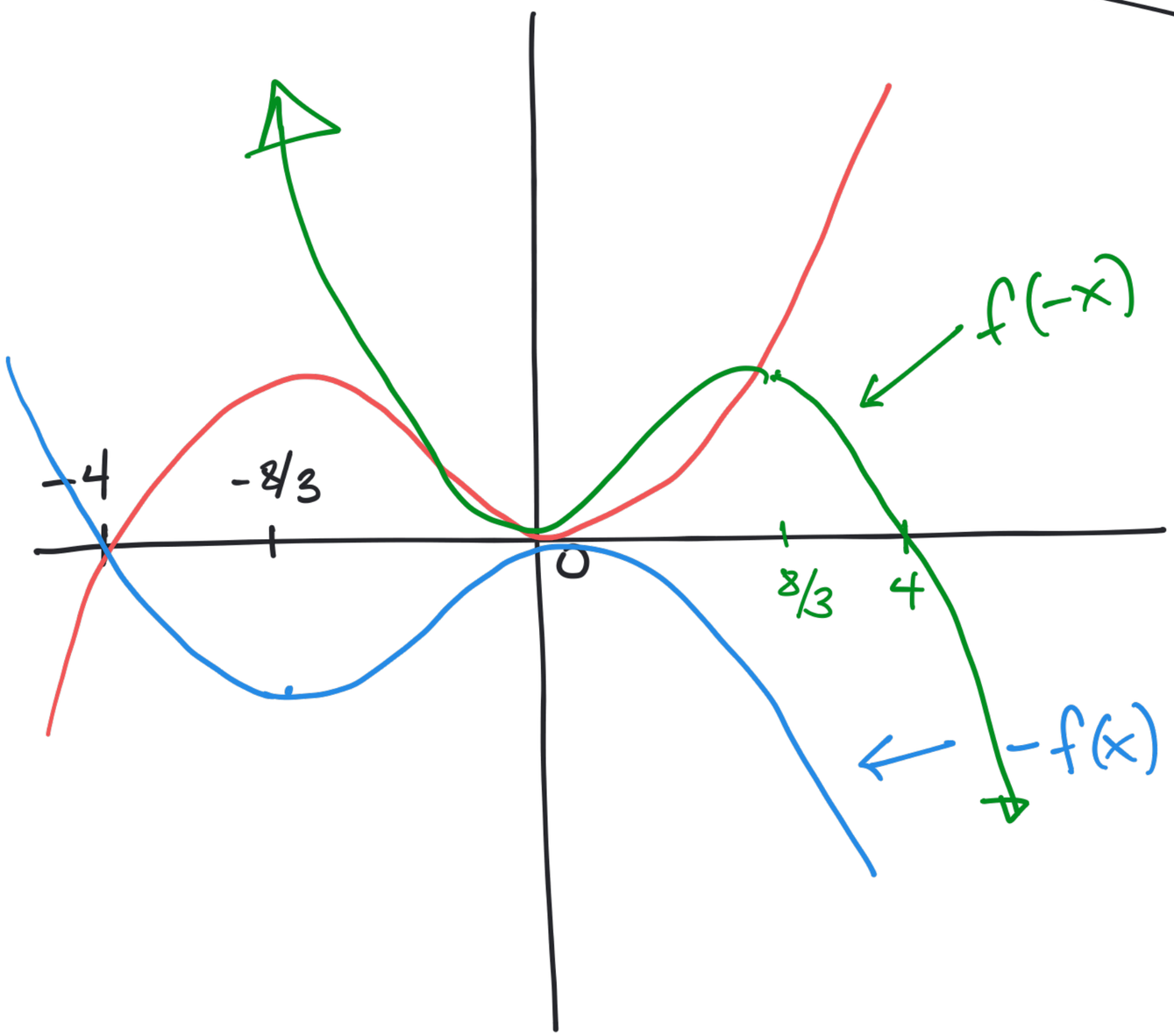

Old behavior at 1 is <u>new</u> behavior at $1/c$

$c = 2$

<u>Compress</u> by 2 $\longleftrightarrow$

$c < 0$: flip across y-axis as well




$-f(x)$: flips ↕ (over x-axis)

$f(-x)$: flips ↔

$f(x) \longrightarrow -f(2x)+3$