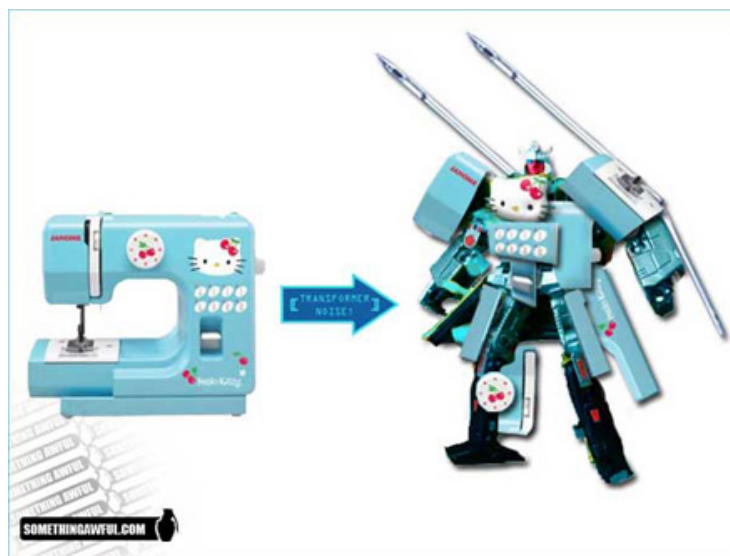
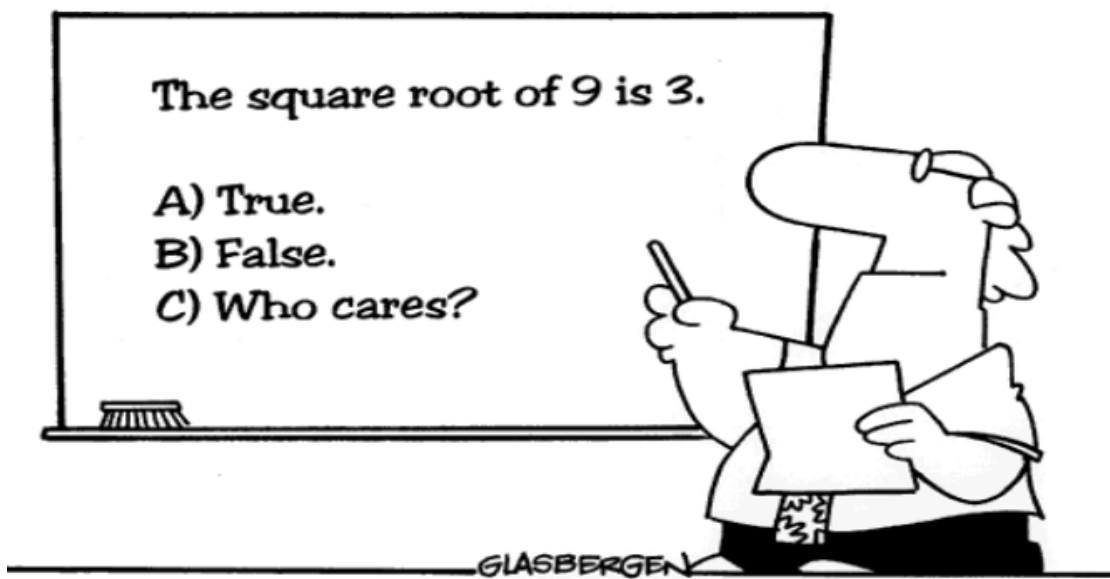


# Transformations of Functions

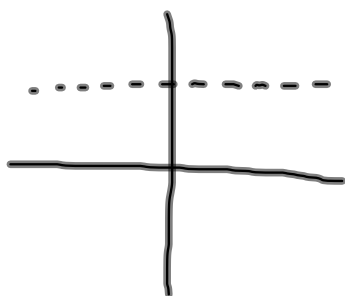




**Many students actually look forward  
to Mr. Atwadder's math tests.**

## Parent Functions:

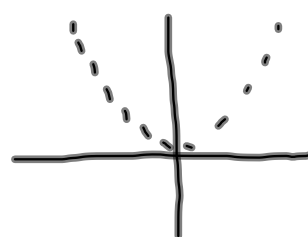
$$f(x) = c$$



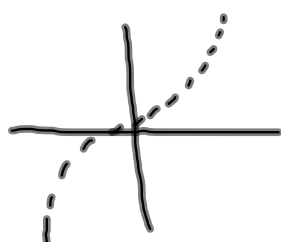
$$f(x) = x$$



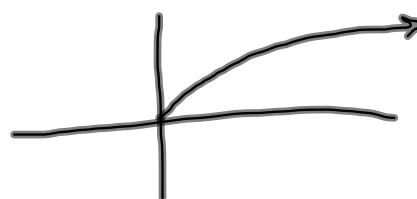
$$f(x) = x^2$$



$$f(x) = x^3$$

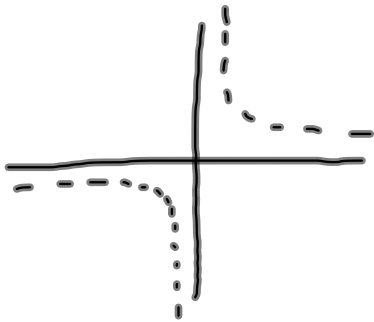


$$f(x) = \sqrt{x}$$

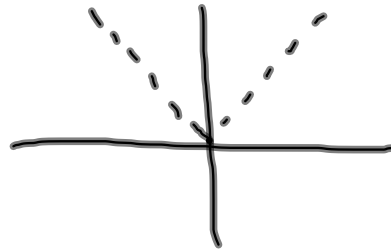


## Parent Functions:

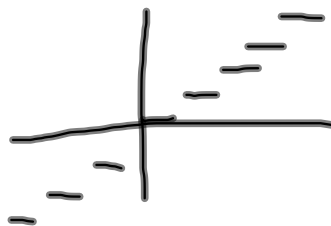
$$f(x) = \frac{1}{x}$$



$$f(x) = |x|$$



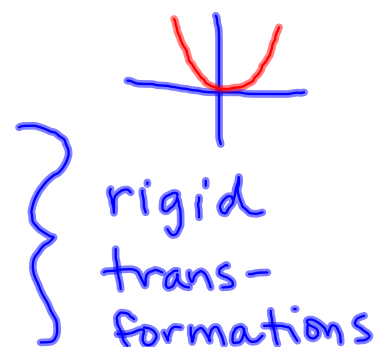
$$f(x) = [x]$$



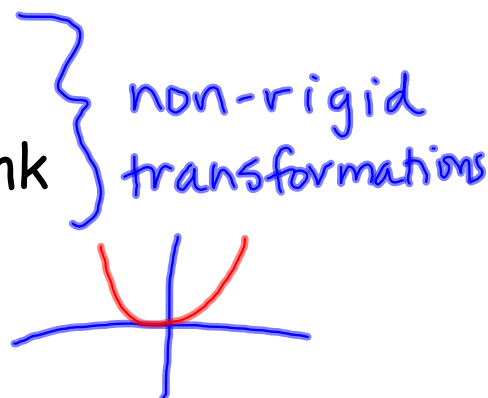
Z

# Transformations:

- Shift vertically or horizontally
- reflect across x-axis or y-axis



- Vertically stretch or shrink
- horizontally stretch or shrink



## Shifts:

UP:  $f(x) + c$

DOWN:  $f(x) - c$

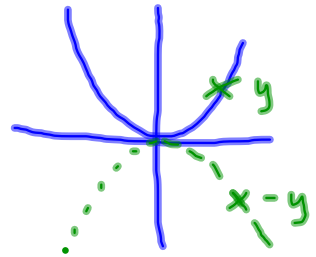
RIGHT:  $f(x - c)$

LEFT:  $f(x + c)$

## Reflecting:

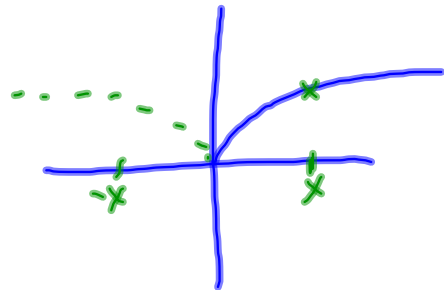
Across the x-axis:

$$-f(x)$$



Across the y-axis:

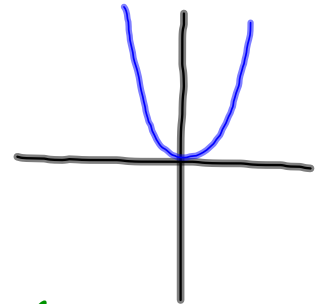
$$f(-x)$$



## Stretch:

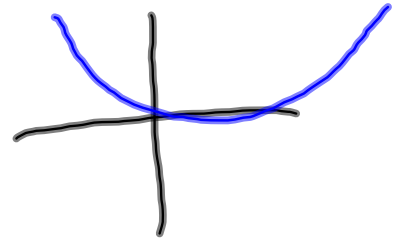
Vertically:  $(c) f(x)$ , where  $c > 1$

$$7x^2$$



Horizontally:  $f(cx)$ , where  $0 < c < 1$

$$\left(\frac{7}{10}x\right)^2$$

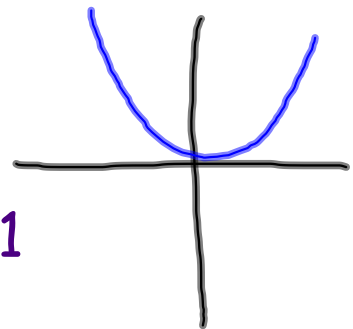




## Shrink:

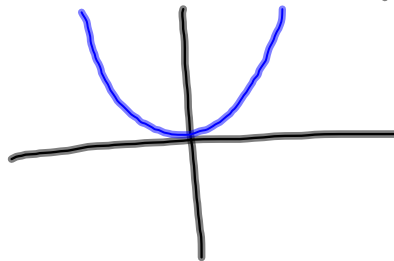
Vertically:  $cf(x)$ , where  $0 < c < 1$

$$\frac{3}{4}x^2$$

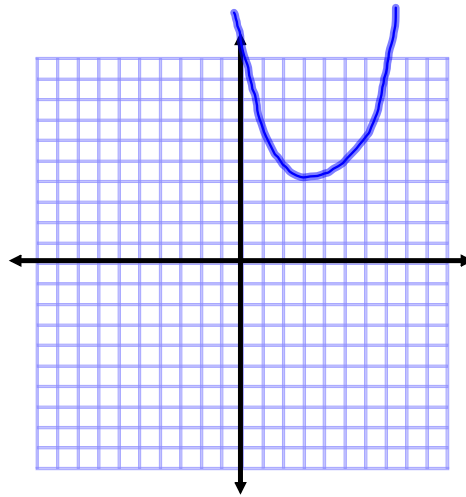


Horizontally:  $f(cx)$ , where  $c > 1$

$$(3x)^2$$



$$f(x) = (x - 3)^2 + 4$$



## Square root

- reflected across x-axis
- shifted left 3
- shifted down 2

abs

moved rt 4

up 5

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#6, 13-18, 43-50