Difference quotient of f:

$$\frac{f(x+h)-f(x)}{h}$$

46. $f(x)=5x^2+4x$

$f(x+h)=5(x+h)^2+4(x+h)$

$$\frac{5(x+h)^2+4(x+h)-(5x^2+4x)}{h}=$$

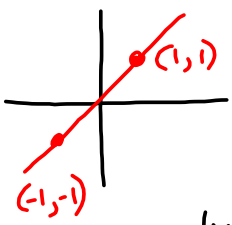
$$\frac{5(x^2+2xh+h^2)+4x+4h-5x^2-4x}{h}=$$

$$=\frac{\cancel{5x^2}+10xh+5h^2+\cancel{4x}+4h-\cancel{5x^2}-\cancel{4x}}{h}=$$

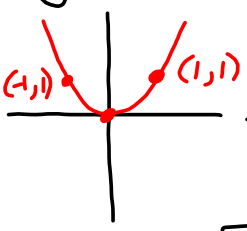
$$=\frac{\cancel{h}(10x+5h+4)}{\cancel{h}}$$

$$=\boxed{10x+5h+4}$$

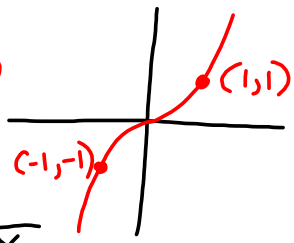
$y=x$



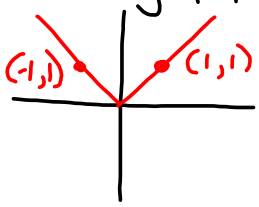
$y=x^2$



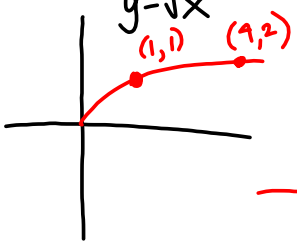
$y=x^3$



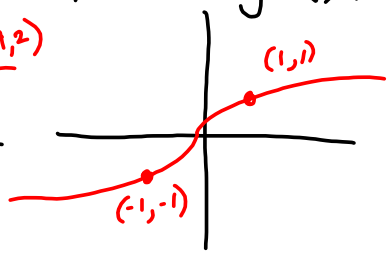
$y=|x|$



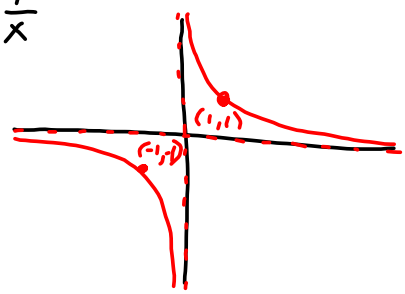
$y=\sqrt{x}$



$y=\sqrt[3]{x}$



$y=\frac{1}{x}$



Graphing by transformations

$y = f(x) \Rightarrow y = af[bx+c] + d$

$y = af\left[b\left(x+\frac{c}{b}\right)\right] + d$

a = vertical shrink/stretch
- If $|a| > 1$ stretch
- If $|a| < 1$ shrink
- If $a < 0$ vertical flip

b = horizontal shrink/stretch
- If $|b| > 1$ shrink
- If $|b| < 1$ stretch
- If $b < 0$ horizontal flip

$\frac{c}{b}$ = horizontal shift
- If $\frac{c}{b} > 0$ left
- If $\frac{c}{b} < 0$ right

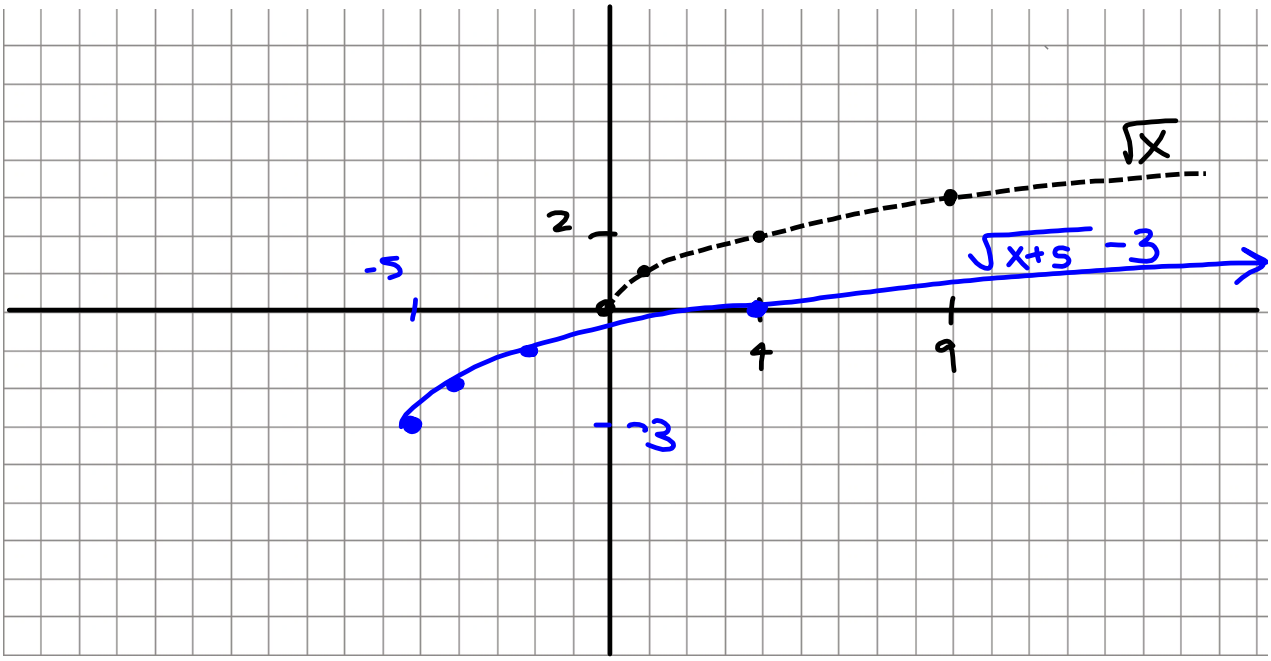
d = vertical shift
- If $d > 0$ up
- If $d < 0$ down

constants multiplied $\leftrightarrow$ shrink/stretch

added/subt $\leftrightarrow$ shifting

outside $\leftrightarrow$ vertically as we would expect

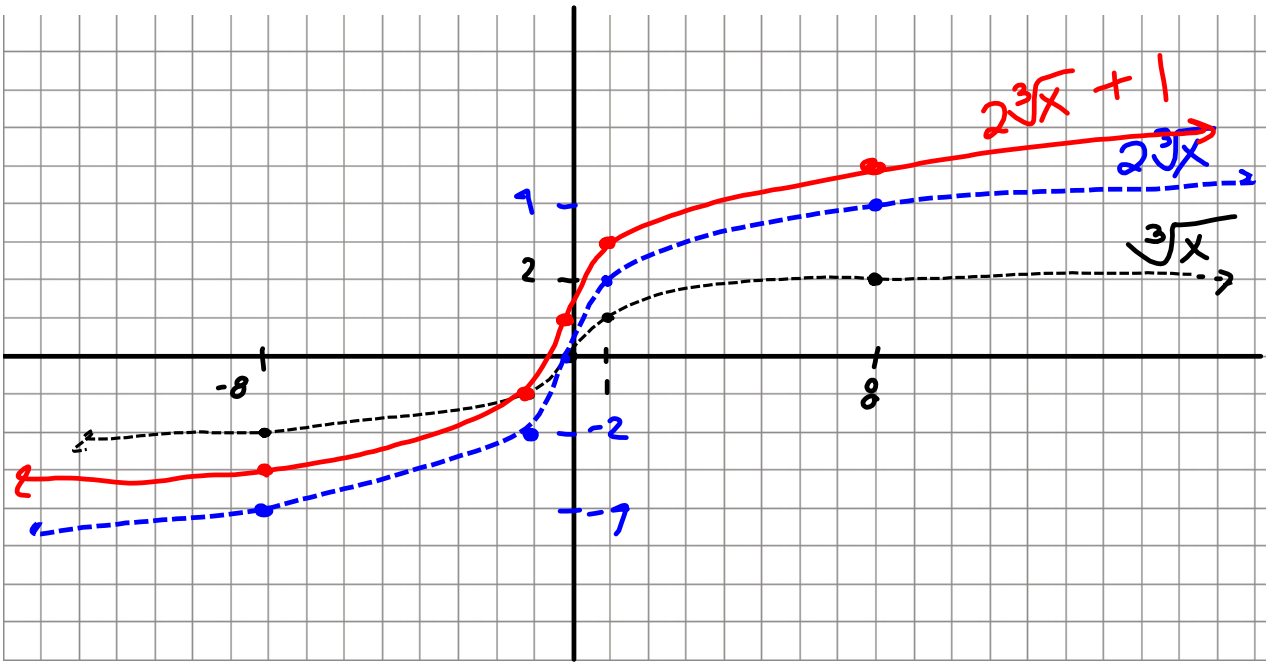
inside $\leftrightarrow$ horizontally, opposite of what we would expect



$y=\sqrt{x+5}-3$

left 5

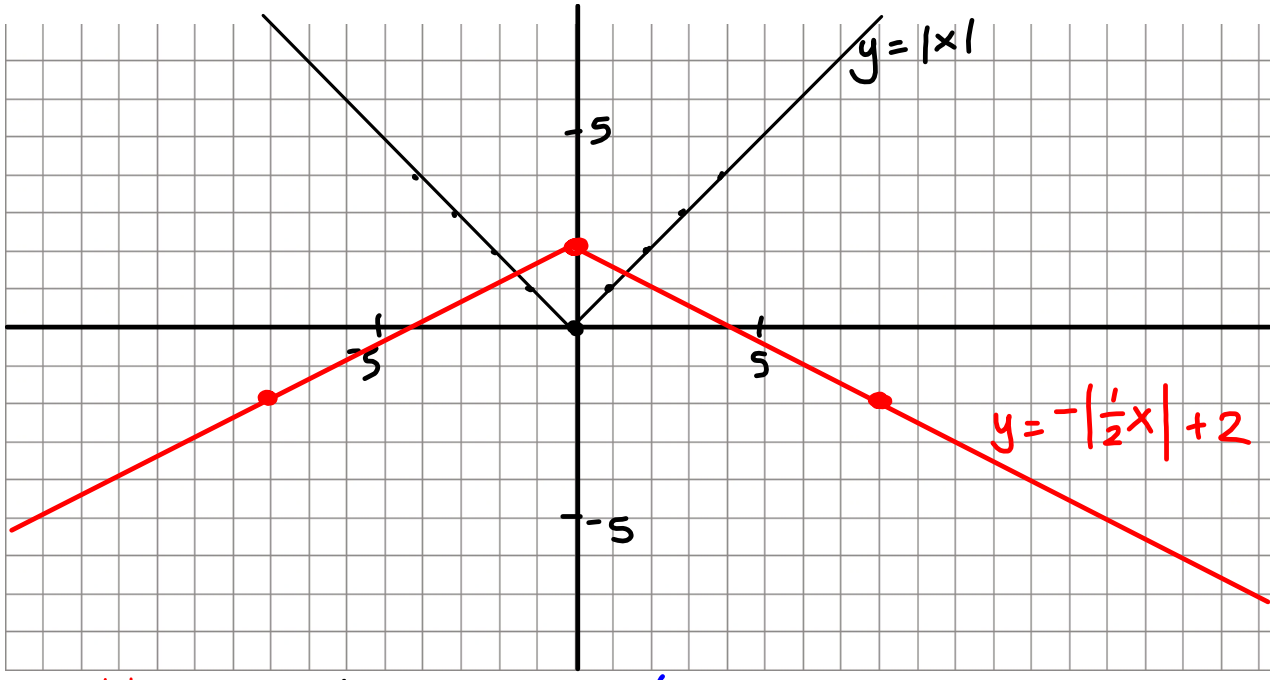
down 3



$y=2\sqrt[3]{x}+1$

vertical stretch by 2

up 1

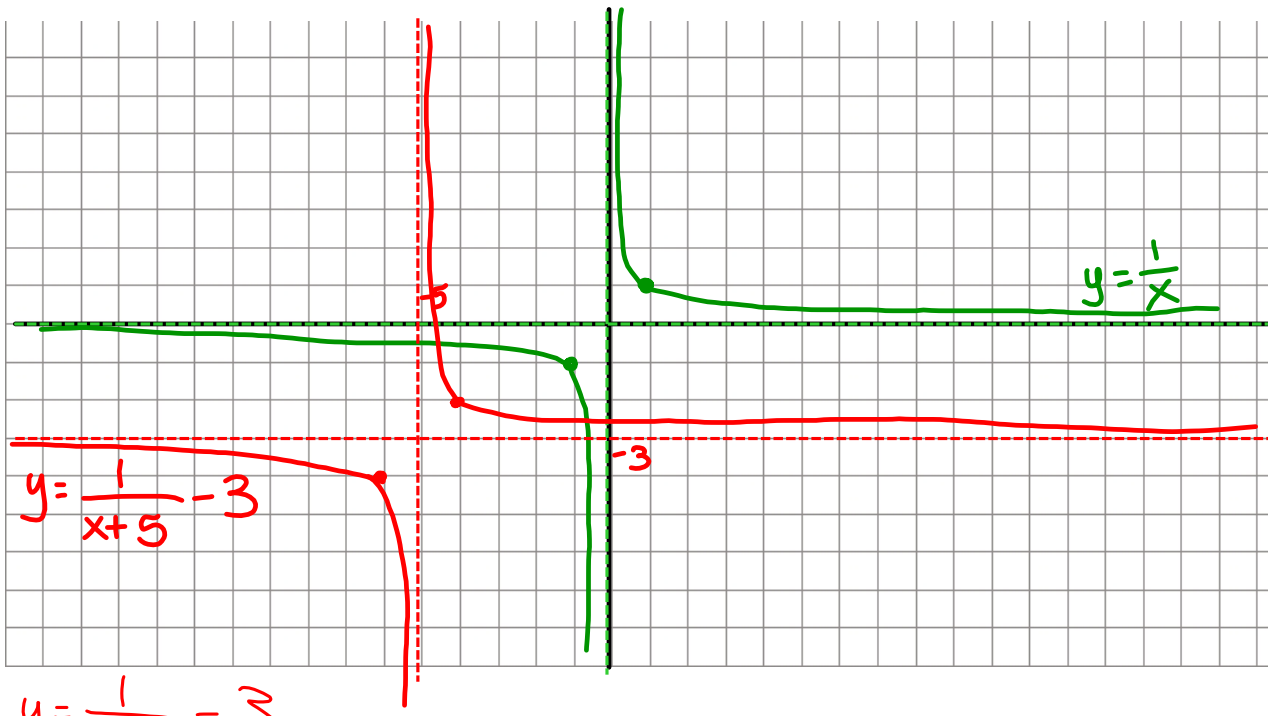


$y = -\left|\frac{1}{2}x\right| + 2$

$(-4,4) \xrightarrow[\text{divide x-coord's by } \frac{1}{2}]{} (-8,-4) \xrightarrow[\text{add 2 to y-coord's}]{} (-8,-2)$

$(0,0) \xrightarrow[\text{multiply y-coord's by } -1]{} (0,0) \longrightarrow (0,2)$

$(4,4) \longrightarrow (8,-4) \longrightarrow (8,-2)$



$y = \frac{1}{x+5} - 3$

left 5

down 3

1.7

96. $y=x^3$

upside down

right 5

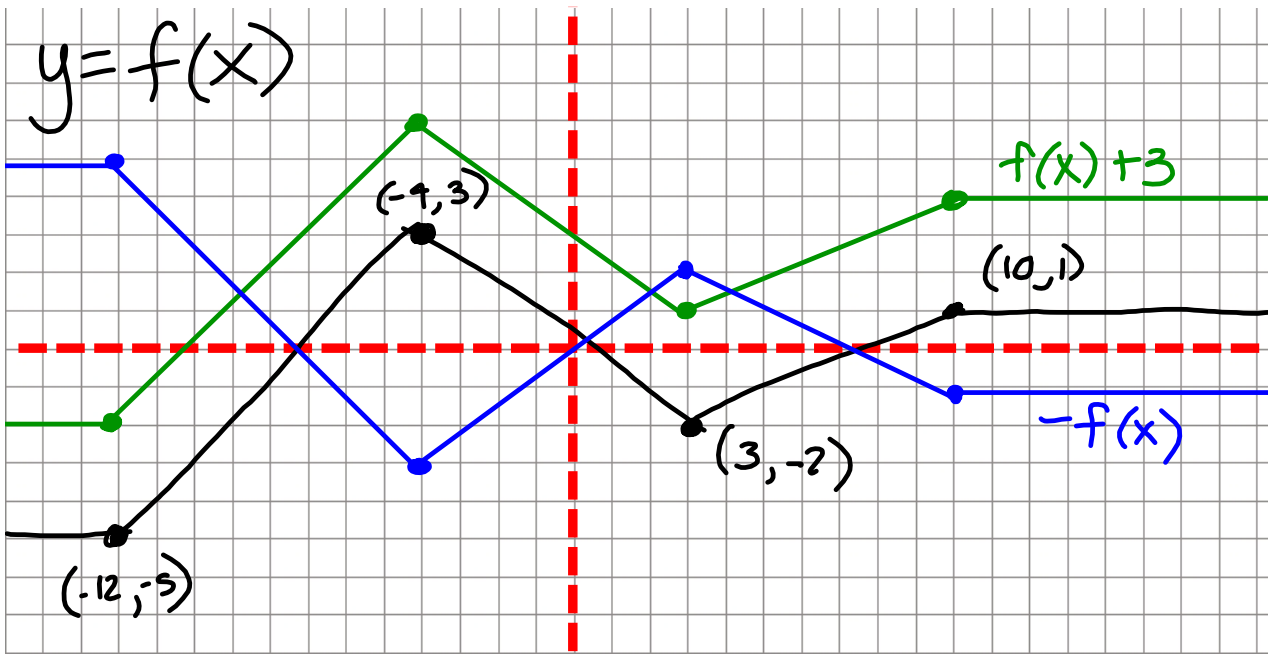
$f(x)=-(x-5)^3$

100. $y=|x|$

stretched horiz. by 2

down 5

$f(x)=\left|\frac{1}{2}x\right|-5$



$y=f(x)+3$

$y=-f(x)$

HW #2 (due Fri, 08/22)

- 1.5: #55-61odd (determining function values of & graphing piecewise functions)
  #69-74all (finding domain, range & equation given graph of a piecewise function)
- 1.6: #23,29,31; 45, 49, 51; 63, 71,75; 81, 83 (algebra of functions)
- 1.7: #9,11,21,23; 39-47odd (symmetry tests)
  ~~#59-69odd; 77-83 odd, 93-101odd; 115-121odd (graphing with transformations)~~
- 2.4: #1,2; 15-22all; 23-27odd

HW #3 (not due until next Fri, 08/27)

- 2.4: #3-13 odd

Test #1 - ~~when?~~

Monday, 8/25