1.2:
- #15-29odd (determining if a relation is a function; determining function values)
- #40,41,42,45,48 (determining domain of a function)
- #59-70all (determining if a graph is a function; domain & range from graph)

1.4:
- #35-47odd; 53-63odd (determining equations of lines; parallel v. perpendicular)

1.5:
- #1-16all (determining characteristics of functions from graphs)
- #47-61odd (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 (parabolas)

2.4: #3-13 odd

Expect Quiz on Tuesday 11/15

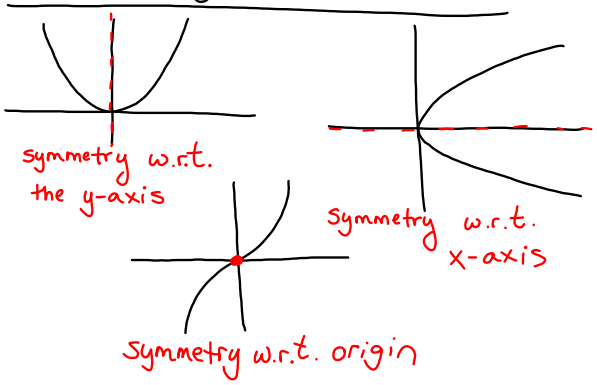
Test on Tues 11/29

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

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

$$\frac{(x+h)^3-(x+h)^2+3-\left[x^3-x^2+3\right]}{h}$$

1.7 Symmetry & Transformations

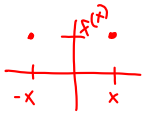


Even / Odd Functions

A function is even if

$f(-x) = f(x)$

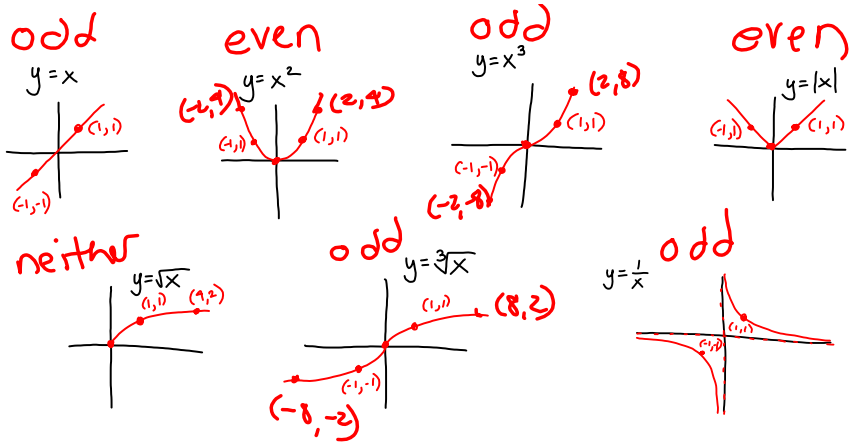
even functions are symmetric w.r.t. the y-axis



A function is odd if

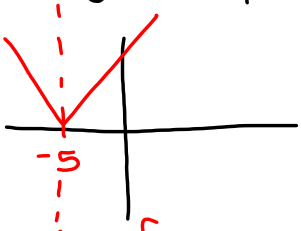
$f(-x) = -f(x)$

odd functions are symmetric w.r.t. the origin



1.7

8. $y = |x+5|$



axis of symmetry: $x = -5$

Is the function symmetric with respect to...

~~x-axis~~: replace y w/ $-y$

$-y = |x+5|$

no $y = -|x+5| \neq |x+5|$

~~y-axis~~: replace x w/ $-x$

no $y = |-x+5| \neq |x+5|$

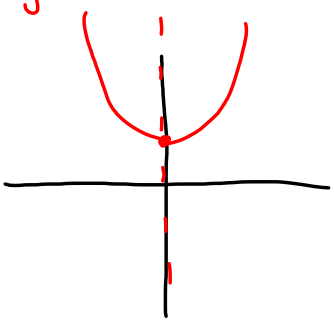
~~origin~~: replace both x & y w/ $-x$ & $-y$

no $y = |-x+5|$

$y = -|-x+5| \neq |x+5|$

12. $x^2+4=3y$

$y=\frac{1}{3}x^2+\frac{4}{3}$



~~x-axis~~: $x^2+4=3(-y)$

no $x^2+4=-3y$

y-axis: $(-x)^2+4=3y$

yes! $x^2+4=3y$

~~origin~~: $(-x)^2+4=3(-y)$

no $x^2+4=-3y$

42. $f(x)=x+\frac{1}{x}$

even / odd / neither?

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

$=-\left(x+\frac{1}{x}\right)$

$=-f(x)$

$\Rightarrow$ f is odd $\Rightarrow$ f is symmetric w.r.t. the origin

40. $f(x) = 7x^3 + 4x - 2$

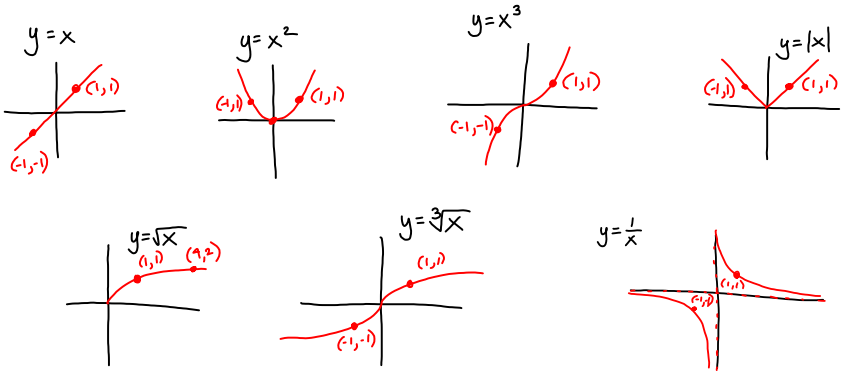
even/odd/neither ?

$f(-x) = 7(-x)^3 + 4(-x) - 2$

$= -7x^3 - 4x - 2 \neq f(x)$

$= -(7x^3 + 4x + 2) \neq -f(x)$

f is neither even nor odd



Graphing by transformations

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

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

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 ↔ shrink/stretch

added/subt ↔ shifting

outside ↔ vertically as we would expect

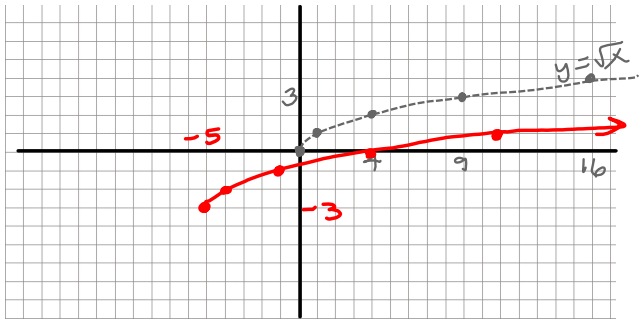
inside ↔ horizontally, opposite of what we would expect

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

$y=\sqrt{x}$ left 5 down 3

(0,0)	(-5,-3)
(1,1)	(-4,-2)
(4,2)	(-1,-1)
(9,3)	(4,0)
(16,4)	(11,1)

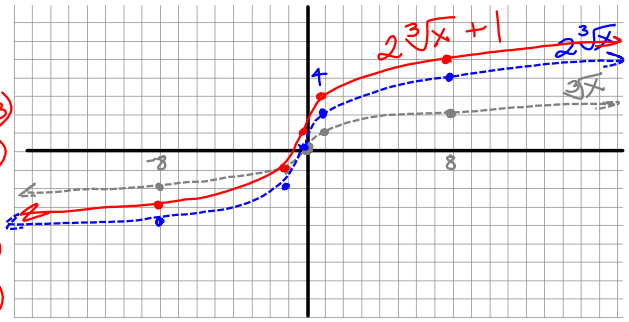
subtr. 5 from x's
subtr. 3 from y's



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

$y=\sqrt[3]{x}$ mult by 2 add 1 to y's

(-8,-2)	(-8,-4)	(-8,-3)
(-1,-1)	(-1,-2)	(-1,-1)
(0,0)	(0,0)	(0,1)
(1,1)	(1,2)	(1,3)
(8,2)	(8,4)	(8,5)



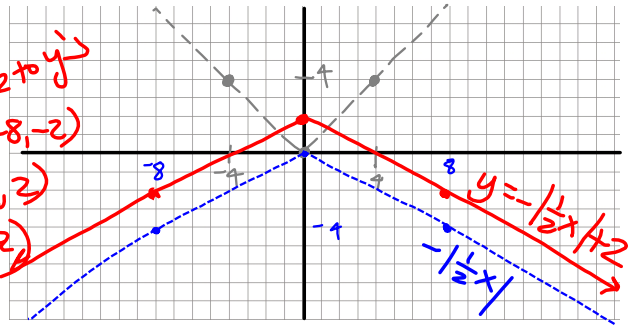
$y = -\left|\frac{1}{2}x\right| + 2$

$y = |x|$ mult y's by -1 divide x's by $1/2$ then add 2 to y's

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

$(0,0) \rightarrow (0,0) \rightarrow (0,2)$

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



$y = -\left(\frac{1}{2}x+3\right)^2 - 2$

$y = x^2$ mult y's by -1, divide x's by $\frac{1}{2}$

$(-2,4) \quad (-4,-4) \quad (-10,-6)$

$(-1,1) \quad (-2,-1) \quad (-8,-3)$

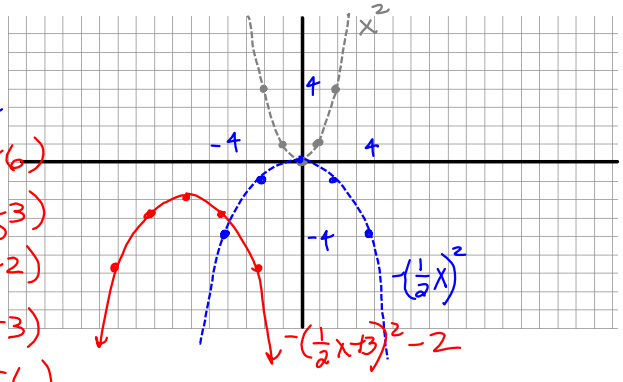
$(0,0) \rightarrow (0,0) \rightarrow (-6,-2)$

$(1,1) \quad (2,-1) \quad (-4,-3)$

$(2,4) \quad (4,-4) \quad (-2,-6)$

subtr. 2 from y's

Subtr. 6 from x's



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

left 5
down 3

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

$(-1,-1)$

$(1,1)$