1. Function:

a relation in which each input maps to exactly one output

2. Domain of a function:

set of inputs for which a function is defined

3. Range of a function: output of the domain

4. $f(x) = \sqrt{x-5}$

$x-5 \geq 0$

$x \geq 5$

$[5, \infty)$

5. $f(x) = \frac{x+3}{3-x}$

$3-x \neq 0$ $3 \neq x$

$(-\infty, 3) \cup (3, \infty)$

6. $f(x) = \frac{1}{\sqrt{x+7}}$

$x+7$ $(-7, \infty)$

$x+7 > 0$

$x > -7$

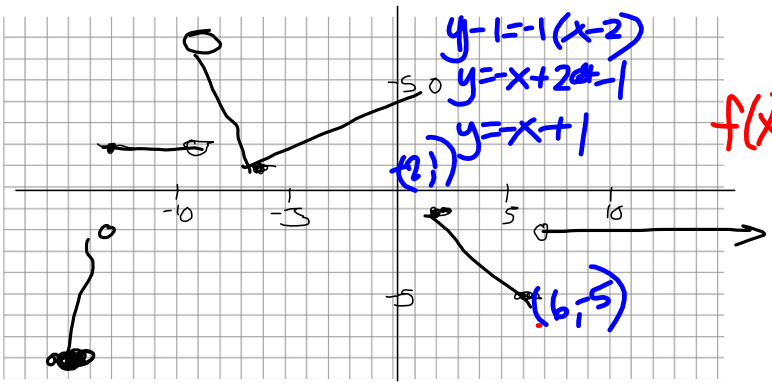
Determine the equation of the lines passing through the point $(-4,9)$ that satisfy the following:

7. Having zero slope

$y = 9$

8. Having undefined (no) slope

$x = -4$



$y-1 = -1(x-2)$

$y = -x+2+1$

$y = -x+1$

$$f(x) = \begin{cases} 3x+37 & -15 \leq x < -13 \\ 2 & -13 \leq x < -9 \\ -2x-11 & -9 < x \leq -6 \\ \frac{1}{2}x+4 & -6 \leq x < 2 \\ -x+1 & 2 \leq x \leq 6 \\ -2, & x > 6 \end{cases}$$

9. Domain of f:

$[-15, 9) \cup (9, \infty)$

10. Range of f:

$[-8, 1] \cup [1, 7)$

11. Open interval(s) over which f is increasing:

$(-15, -13) \cup (-6, 2)$

12. Open interval(s) over which f is decreasing:

$(-9, -6) \cup (2, 6)$

13. Open interval(s) over which f is constant:

$(-13, -9) \cup (6, \infty)$

14. The coordinates of any relative maxima of f:

none

15. The coordinates of any relative minima of f:

$(-15, -8), (-6, 1), (6, -5)$

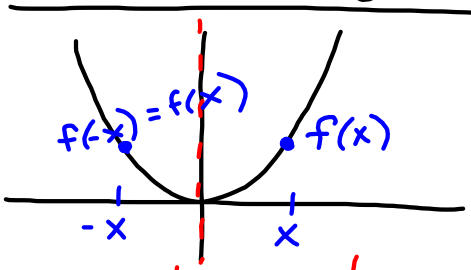
16. The absolute maximum value of the function (if it exists) and the x-value(s) at which it is attained:

none

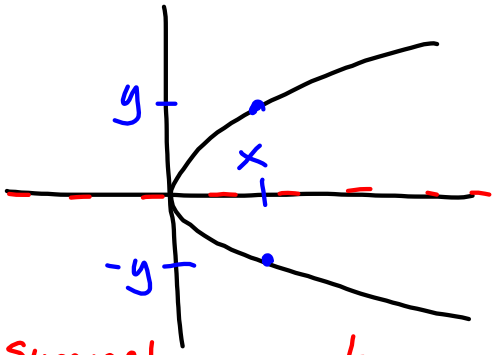
17. The absolute minimum value of the function (if it exists) and the x-value(s) at which it is attained:

-8 @ $x = -15$

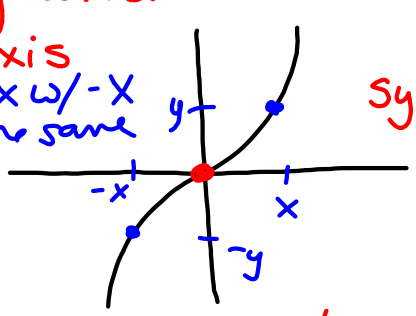
1.7 Symmetry & Transformations



symmetry w.r.t. the y-axis if replacing x w/ -x results in the same equation



Symmetry w.r.t. x-axis if replacing y w/ -y results in same eq.

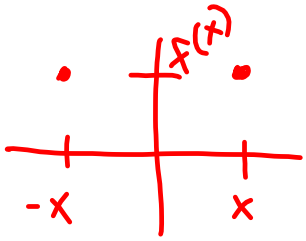


Symmetry w.r.t. origin replacing both x & y w/ -x & -y results in same eq.

Even / Odd Functions

A function is <u>even</u> if

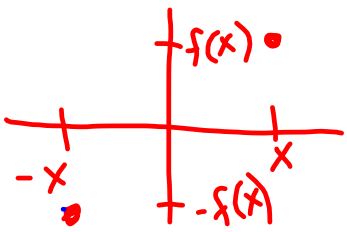
$$f(-x) = f(x)$$



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

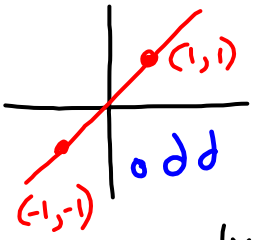
A function is <u>odd</u> if

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

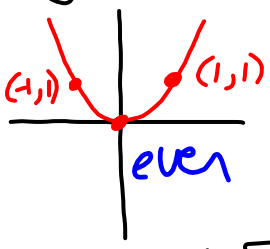


odd functions are symmetric w.r.t. the origin

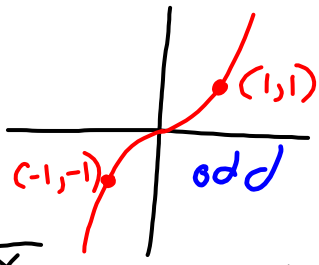
$y = x$



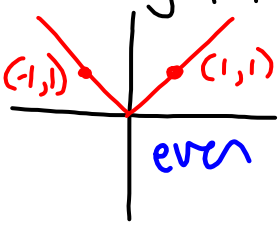
$y = x^2$



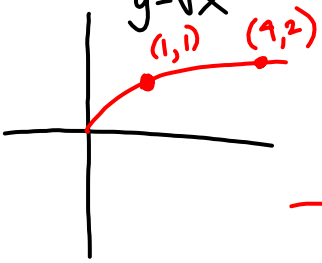
$y = x^3$



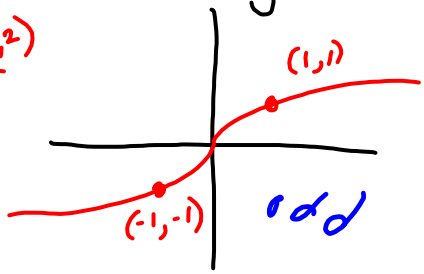
$y = |x|$



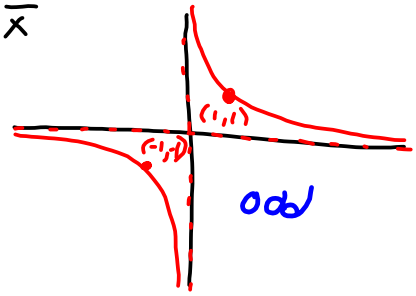
$y = \sqrt{x}$



$y = \sqrt[3]{x} = x^{1/3}$



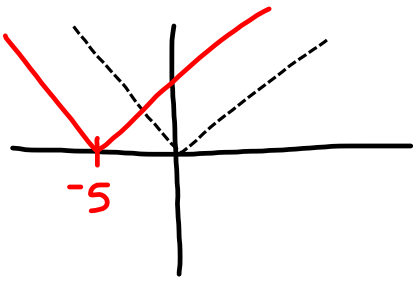
$y = \frac{1}{x}$



1.7

Is the function symmetric with respect to...

8. $y = |x+5|$



x-axis: replace y w/ -y

$-y = |x+5|$

$y = -|x+5|$ no

y-axis: replace x w/ -x

$y = |-x+5|$ no

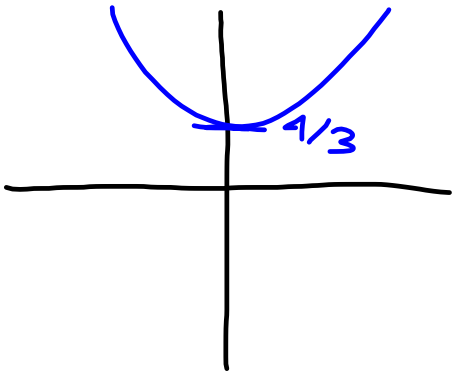
origin: replace x & y w/ -x & -y

$-y = |-x+5|$

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

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?

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

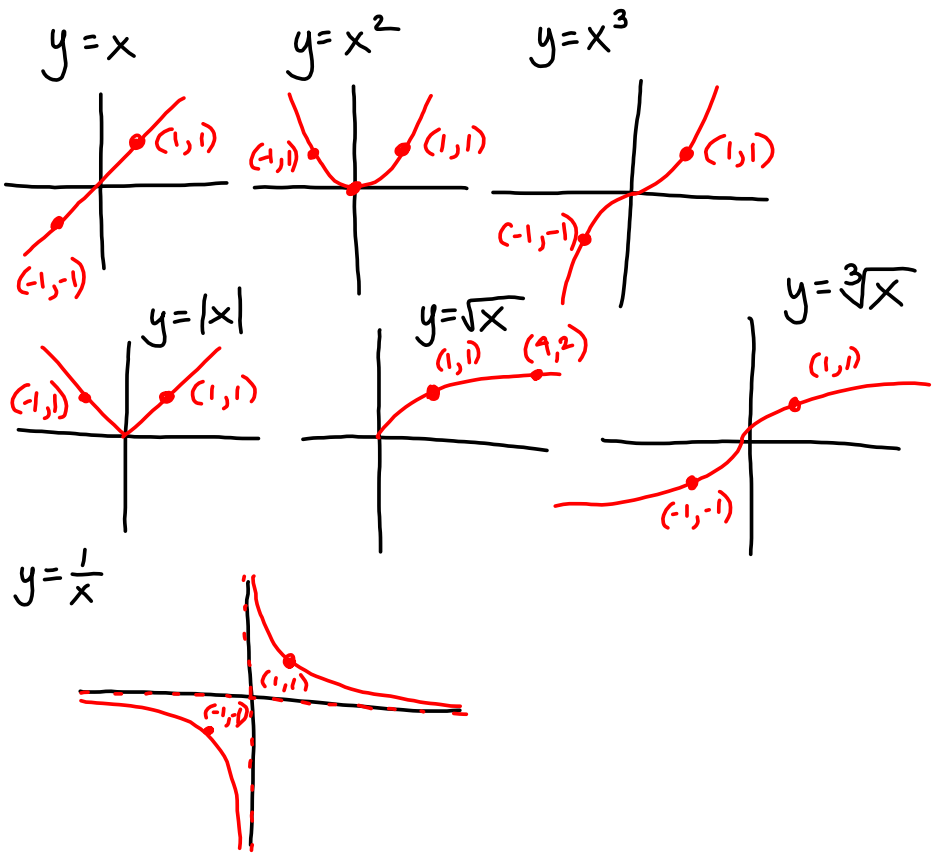
$\Rightarrow$ f is $\boxed{\text{odd}}$

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

even/odd/neither ?

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

$= -7x^3 - 4x - 2$



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

HW #2 (due Fri, 08/22- ~~TestDay!~~)

- 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)

Test #1 - Friday, 8/22

Mon?
Wed?