

Monday, October 01, 2018  
8:27 PM

Precalc **KEY**

1.6A Families of functions

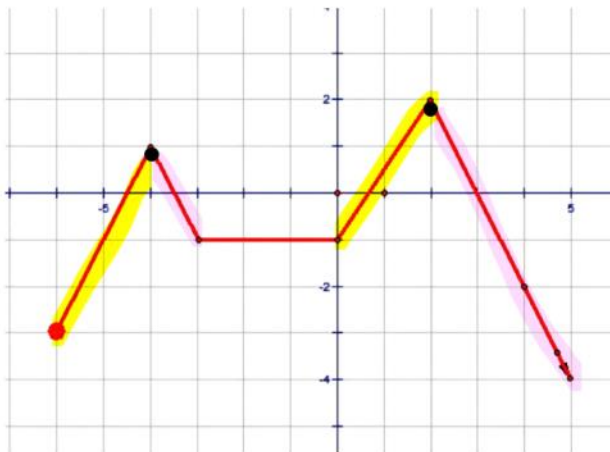
Obj: to ID and graph linear, quadratic, cubic, square root, and reciprocal functions

Hwk: 1.6A #1, 7, 11 - 27 odd (sketch graphs in notebook)

Check answers w/ textbook or calcchat!

Do Now: Do "1.6A Do Now".

Answer the following:



1. Is this a function? yes
2. Even/odd/neither? neither
3. Domain:  $[-6, \infty)$
4. Range:  $[-\infty, 2]$
5. Approximate zeros:  $\{-4.5, -3.5, .75, 3\}$
6. Increasing:  $(-6, -4) \cup (0, 2)$
7. Decreasing:  $(-4, -3) \cup (2, \infty)$
8. Constant:  $(-3, 0)$
9. Relative max:  $(-4, 1) (2, 2)$
10. Relative min:  $(-6, -3)$

Precalculus - the intensive study of functions

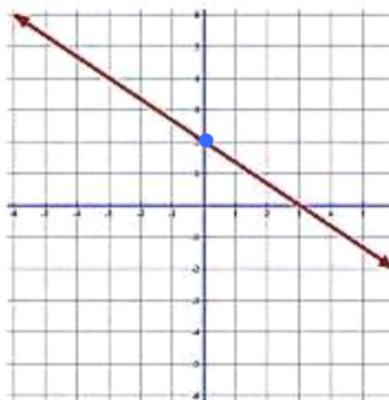
Parent Function: "basic" function before transformation(s)

Together, Analyze Linear Functions.

**Linear function:**  $f(x) = ax + b \leftarrow$  LINE

## Together: Linear Functions

$$f(x) = mx + b$$



$$\text{x-int: } \left(-\frac{b}{m}, 0\right)$$

Domain	$(-\infty, \infty)$	Range	$(-\infty, \infty)$
Intercepts	y-int $(0, b)$	Increasing: Decreasing: Constant: Intervals?	If $m > 0$ , ↗; if $m < 0$ , ↘; if $m = 0$ , ↔; if $m$ undef., ↕
Min or Max? Location?	none	Anything else?	
Even, odd, or neither?	neither		

### Two special cases:

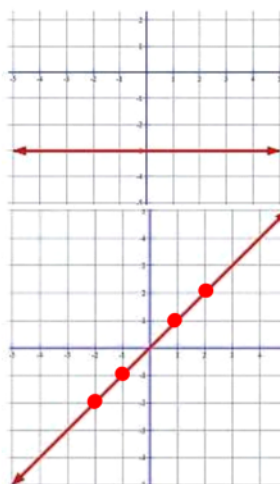
- Constant function:  $f(x) = c$

- Domain:  $D: (-\infty, \infty)$
- Range:  $R: [c, c]$

- Identify function:  $f(x) = x$

- Domain:  $D: (-\infty, \infty)$
- Range:  $R: (-\infty, \infty)$

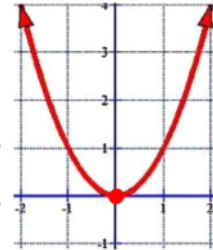
$$m = 1; \quad \text{y-int: } (0, 0)$$



In Groups: 1.6A: Analysis of Parent Functions. Analyze 2 functions; then 2 people swap w/ adjoining group. Discuss & fill in answers. Do you all agree?

**Group 1: Squaring Function**

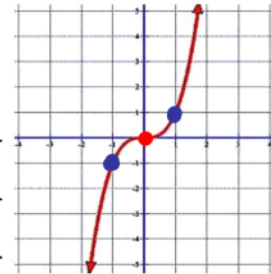
$$f(x) = x^2$$



Domain:	$(-\infty, \infty)$				
Range:	$[0, \infty)$				
Intercept(s):	$(0, 0)$				
Min or Max: Location:	$(0, 0)$				
Increasing Interval(s):	$(0, \infty)$	Decreasing Interval(s):	$(-\infty, 0)$	Constant Interval(s):	—
Even, odd, or neither?	even, symmetric about y-axis				
Anything else?					

**Cubic Function**

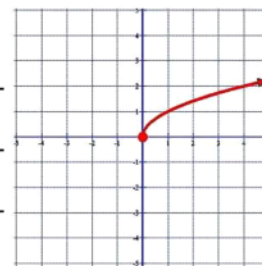
$$f(x) = x^3$$



Domain:	$(-\infty, \infty)$				
Range:	$(-\infty, \infty)$				
Intercept(s):	$(0, 0)$				
Min or Max: Location:	none				
Increasing Interval(s):	$(-\infty, \infty)$	Decreasing Interval(s):	—	Constant Interval(s):	—
Even, odd, or neither?	ODD, symmetric about the origin $(1, 1)$ $(-1, -1)$				
Anything else?	point of inflection $(0, 0)$				

## Group 2: Square Root Function

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



Domain:	$[0, \infty)$				
Range:	$[0, \infty)$				
Intercept(s):	$(0, 0)$				
Min or Max: Location:	Min at $(0, 0)$				
Increasing Interval(s):	$(0, \infty)$	Decreasing Interval(s):	—	Constant Interval(s):	—
Even, odd, or neither?	Neither - no symmetry				
Anything else?					

## Reciprocal Function

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

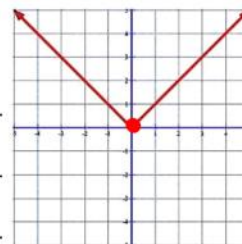


Domain:	$(-\infty, 0) \cup (0, \infty)$				
Range:	$(-\infty, 0) \cup (0, \infty)$				
Intercept(s):	none				
Min or Max: Location:	—				
Increasing Interval(s):	—	Decreasing Interval(s):	$(-\infty, 0) \cup (0, \infty)$	Constant Interval(s):	—
Even, odd, or neither?	ODD: symmetry about the origin * $(1, 1) \quad (-1, -1) \quad (2, 1/2) \quad (-2, -1/2)$				
Anything else?	Asymptotes at $x+y$ axis $y=0 \quad x=0$				

\* TEST:  $f(-x) = \frac{1}{-x} = -\frac{1}{x} = -f(x) \quad \checkmark \quad \text{ODD}$

## Together: Absolute Value Function

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



Domain:	$(-\infty, \infty)$				
Range:	$[0, \infty)$				
Intercept(s):	$(0, 0)$				
Min or Max: Location:	$\text{min } (0, 0)$				
Increasing Interval(s):	$(0, \infty)$	Decreasing Interval(s):	$(-\infty, 0)$	Constant Interval(s):	—
Even, odd, or neither?	$\text{even} - \text{Symmetric about } y\text{-Axis}$ $\text{TEST: } f(-x) =  -x  =  x  = f(x) \checkmark$				
Anything else?					

\* Ex. 1) Write the linear function for which  $f(-2) = 6$  and  $(4, -9)$   $f(4) = -9$ .

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{6 - (-9)}{-2 - 4} = \frac{15}{-6} = -\frac{5}{2}$$

$$y - y_1 = m(x - x_1)$$

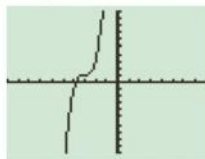
$$y - 6 = -\frac{5}{2}(x + 2)$$

$$y - 6 = -\frac{5}{2}x - 5$$

$$y = -\frac{5}{2}x + 1$$

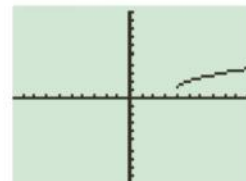
Ex. 2) Identify the parent function. Then sketch its graph using a graphing utility.

Reciprocal a)  $f(x) = 4 + \frac{1}{x+3}$



b)  $g(x) = \sqrt{(x-4)+1}$

Square root

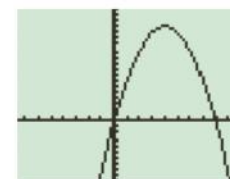


c)  $h(x) = 2(x+3)^3 + 1$

Cubic

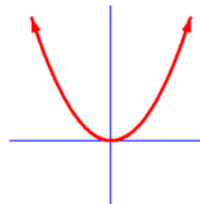
d)  $j(x) = -x^2 + 8x$

Quadratic (Squaring)



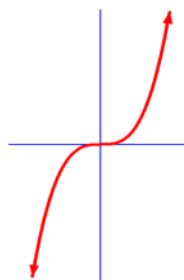
**Squaring Function:  $f(x) = x^2$  ← PARABOLA**

- D:  $(-\infty, \infty)$
- Even function
- Relative min. at  $(0, 0)$   
[aka y-int]
- R:  $[0, \infty)$
- Decreasing on  $(-\infty, 0)$ ,  
increasing on  $(0, \infty)$



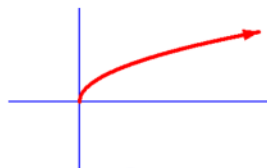
**Cubic Function:  $f(x) = x^3$**

- D:  $(-\infty, \infty)$
- Odd function
- y-int:  $(0, 0)$
- R:  $(-\infty, \infty)$
- increasing on  $(-\infty, \infty)$



**Square Root Function:  $f(x) = \sqrt{x}$**

- D:  $[0, \infty)$
- y-int:  $(0, 0)$
- R:  $[0, \infty)$
- increasing on  $(0, \infty)$



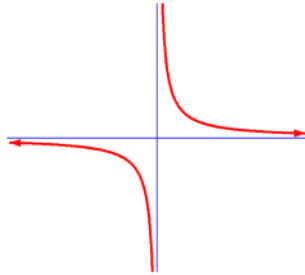
**Reciprocal Function:  $f(x) = \frac{1}{x}$**

- D:  $(-\infty, 0) \cup (0, \infty)$
- R:  $(-\infty, 0) \cup (0, \infty)$



- Odd function
- No intercepts (axes are asymptotes)

- decreasing on  $(-\infty, 0)$ ,  $(0, \infty)$



Do Parent Functions (1.6A) (ditto)