Warm-up for 1/28/14

Factor completely. If not factorable, write prime.

1. $x^2 - x - 12$

2. $4x^2 - 9$

3. $5x^2 - 12x + 4$

Piece Wise Defined Functions

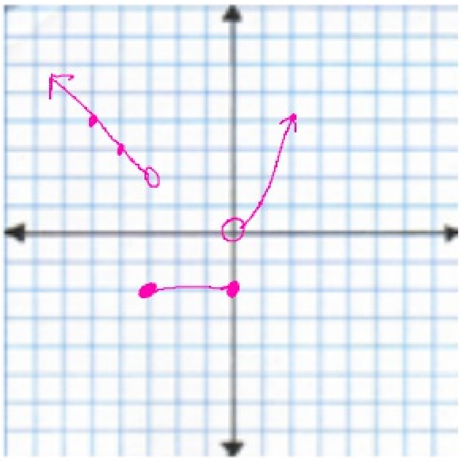
~"frankenstein" functions

~each level of the function represents a new portion of the graph and has its own domain restrictions

~should be able to graph and evaluate

Ex Sketch the graph.

$$f(x)=\begin{cases} x^2, & x>0 \quad \text{I} \\ -2, & -3\le x\le 0 \quad \text{II} \\ -x, & x< -3 \quad \text{III} \end{cases}$$



I.

	x	$y=x^2$
open	0	0
	1	1
	2	4

kg

II.

	x	$y=-2$
closed	-3	-2
	-2	-2
	-1	-2
closed	0	-2

III.

	x	$y=-x$
~~closed~~ open	-3	3
	-4	4
	-5	+5

kg

Ex Evaluate the function for the given values of *x*.

$$f(x) = \begin{cases} 3 - x^2, & x > -3 \\ 2x + 1, & x \le -3 \end{cases}$$

A. *f(-7)*

$2(-7) + 1$

$-14 + 1$

-13

B. *f(-3)*

$2(-3) + 1$

-5

C. *f(0)*

$3 - (0)^2$

$\boxed{3}$

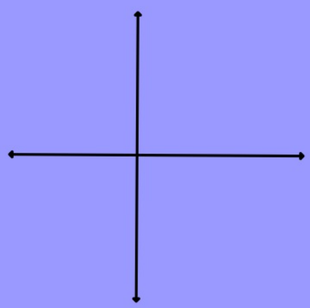
<u>End Behavior</u> what the curve is doing on the extreme right hand and left hand sides; use limit notation

$$\lim_{x \to \infty} f(x)$$ as x gets bigger and bigger, what is the y pattern?

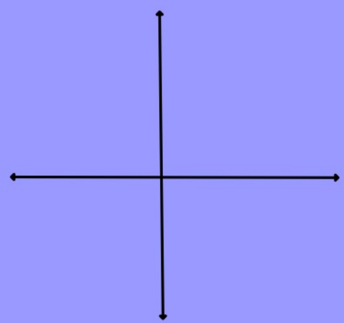
$$\lim_{x \to -\infty} f(x)$$ as x gets smaller and smaller, what is the y pattern?

<u>Ex</u>

A.



B.



1.4 Building Functions from Functions

Ex Use the following functions to perform the indicated operations.

$$f(x) = \frac{x}{x+1} \quad \text{and} \quad g(x) = \frac{3x}{x^2-1}$$

Add/Subt: $f(x) \pm g(x)$, $(f \pm g)(x)$, $f \pm g$

A. $g(x) - f(x)$

$$\frac{3x}{x^2-1} - \frac{x(x-1)}{(x+1)(x-1)}$$

$(x-1)(x+1)$

$$\frac{3x - x(x-1)}{(x+1)(x-1)}$$

$$\frac{3x - x^2 + x}{(x+1)(x-1)}$$

$$\frac{-x^2+4x}{(x-1)(x+1)}$$

$$\frac{-x(x-4)}{(x-1)(x+1)}$$

Multiply: $f(x) \bullet g(x)$, $(fg)(x)$, fg

B. $g(x) \bullet f(x)$

$$\frac{3x}{x^2-1} \bullet \frac{x}{x+1}$$

$$\frac{3x^2}{(x^2-1)(x+1)}$$

$x \neq \pm 1$

$(-\infty,-1) \cup (-1,1) \cup (1,\infty)$

Divide: $\frac{f(x)}{g(x)}, g(x) \neq 0$ $\left(\frac{f}{g}\right)(x),\ g(x) \neq 0$ $\frac{f}{g}, g \neq 0$

C. $\frac{g}{f}$

$$\frac{\frac{3x}{x^2-1}}{\frac{x}{x+1}} \quad \frac{3\cancel{x}}{\cancel{x^2-1}} \cdot \frac{\cancel{x+1}}{\cancel{x}} \quad \boxed{\frac{3}{x-1}}$$

$(x-1)\cancel{(x+1)}$

$D: (-\infty, 1) \cup (1, \infty)$

Composite Functions placing a function inside another function

~Notation: $f(g(x))$ or $g(f(x))$ $\quad f \circ g \quad g \circ f$

Ex The given function is the composition of two functions. State the two functions.

A. $h(x) = \sqrt{x-1}$

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

$g(x) = x - 1$

B. $h(x) = (3-2x)^4$

$f(x) = x^4$

$g(x) = 3 - 2x$

C. $h(x) = \frac{1}{3x^2 - 7}$

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

$g(x) = 3x^2 - 7$

Ex Find $f(g(x))$.

A. $f(x) = 3x + 2 \quad g(x) = x + 7$

$3(x+7) + 2$

$3x + 21 + 2$

$3x + 23$

B. $f(x) = \frac{1}{x+1} \qquad g(x) = \frac{1}{x-1}$

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

$$\frac{1}{\frac{\cancel{1} + x \cancel{-1}}{x-1}}$$

$$\frac{1}{\frac{x}{x-1}}$$

$$1 \cdot \frac{x-1}{x}$$

$$\frac{x-1}{x}$$

x given: $f(g(x))$ $g(f(x))$

$f = \{(2,6), (9,4), (7,7), (0, -1)\}$

$g = \{(7,0), (-1,7), (4,9), (8,2)\}$

A.

B.

Lesson Title: 1.5 Inverse Functions

Objectives: SWBAT find inverse functions both informally and algebraically; graph a function and its inverse; determine if a function is one-to-one and determine whether two functions are inverses using composite functions.

Homework: p.135(9,10)(13-21odd)(23,24,29,31,33)

Test/Quiz: Test (1.2-1.7) 9/11; Quiz (1.2-1.3, 1.6) 9/7

Agenda:

1. Warm-Up: Piece Wise Functions Worksheet (odd)
2. Go over Homework
3. Notes: Inverses
4. Closure: Transformations of Functions Worksheet (half)

Graph each function.

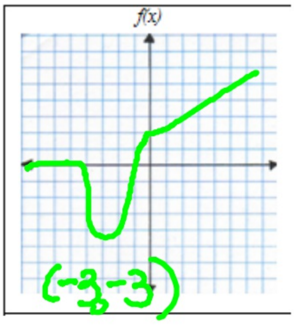
$f(x)=\begin{cases}1+x, & x<0\\ x^2, & x\ge 0\end{cases}$		$f(x)=\begin{cases}x^3, & x<0\\ 3x+2, & x\ge 0\end{cases}$	
$f(x)=\begin{cases}x^2, & x\ge 0\\ 2, & x=0\\ 2x+1, & x<0\end{cases}$		$f(x)=\begin{cases}3+x, & -3\le x<0\\ 3, & x=0\\ \sqrt{x}, & x>0\end{cases}$	
$f(x)=\begin{cases}-2x-3, & x<-1\\ 4, & -1<x\le 3\\ x+2, & x>3\end{cases}$			

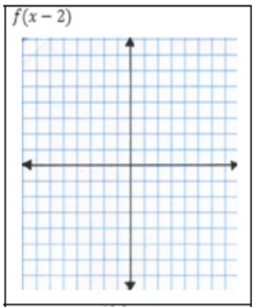
only complete ones circled in yellow for homework!

Evaluate.

$f(x)=\begin{cases}6x, & x<3\\ 2-x^2, & x\ge 3\end{cases}$	$f(3)$	$f(7)$	$f(-1)$

over





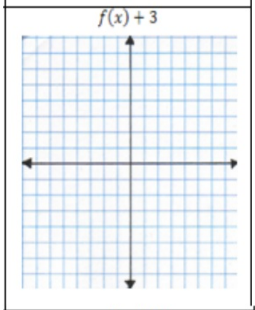
$X-2=0$

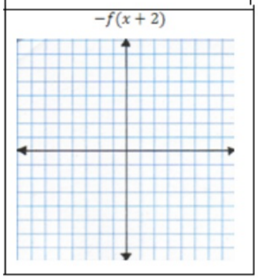
$x=2$

R2

f(−x)

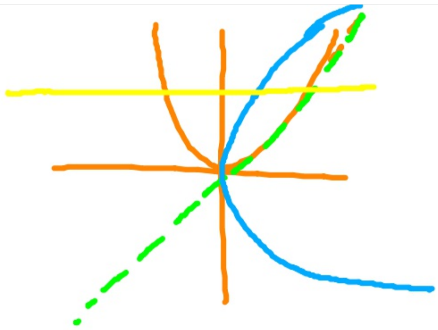
U3





Do all of this worksheet for homework

1. 5 Inverses



~Notation: $f^{-1}(x)$

~To create an inverse algebraically:

1. switch x & y
2. solve for y

~To create an inverse from a graph: reflect over the y = x line

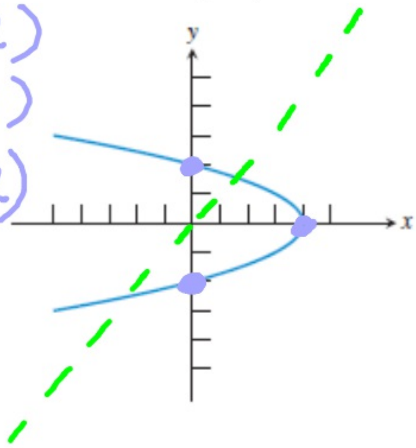
~When creating inverses of functions, sometimes the inverse created is not a function---it is a relation.

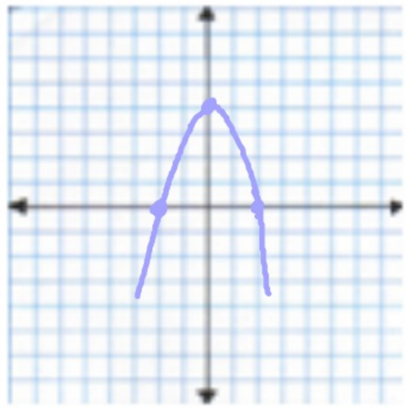
~Functions are said to be ***one-to-one*** *(1-1)* if each y pairs with exactly one x-value. We can use the HLT to determine if a function is 1-1.

~To predict whether the inverse will be a *relation* or a *function*, we use the Horizontal Line Test (HLT)

Ex Sketch the graph of the inverse function.

(0,2)
(4,0)
(0,-2)





(2,0)
(0,4)
(-2,0)

Ex Find the inverse of the given function. Be sure to include any restrictions on the domains of either function.

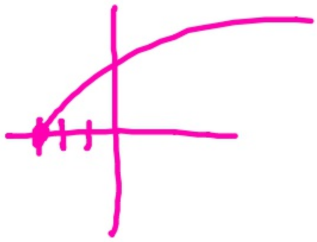
$f(x) = \sqrt{x+3}$

$(x)^2 = \left(\sqrt{y+3}\right)^2$

$x^2 = y+3$

$y = x^2 - 3$

$f^{-1}(x) = x^2 - 3$



**not quite done with this one...
more on Monday!**