Lesson 9
9.21.15
(section 3.1 and 3.2)
Function Symmetry.

A function has a graph that is symmetrical around the origin if and only if $f(-x) = -f(x)$ for all x in the domain of f.

THE TEST: if $(x, y) \in S, does\ (-x, -y)\ \in S$?
$\in$ *means belongs to*

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I try:

Is $f(x) = x^5 symmetrical\ around\ the\ origin$?

Solve it algebraically.

$Given$	$f(x) = x^5$	
Solve for $f(-x)$ and $-f(x)$	$f(-x) = (-x)^5$	$-f(x) = -x^5$
Check Does $f(-x) = -f(x)$?	$Does\ (-x)^5 = -x^5$ $-x^5 = -x^5$ YES $f(x) = x^5 is\ symmetrical\ around\ the\ origin.$	

We Try:

Is $f(x) = x - 5$ $symmetrical\ around\ the\ origin$?

Solve it algebraically.

$Given$	$f(x) = x - 5$	
Solve for $f(-x)$ and $-f(x)$	$f(-x) =$	$-f(x) =$
Check Does $f(-x) = -f(x)$?		

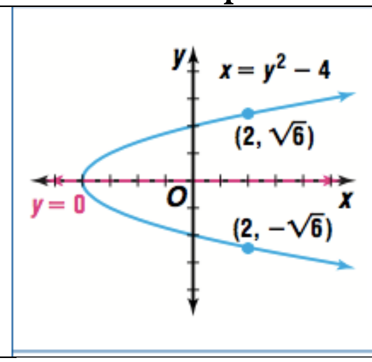
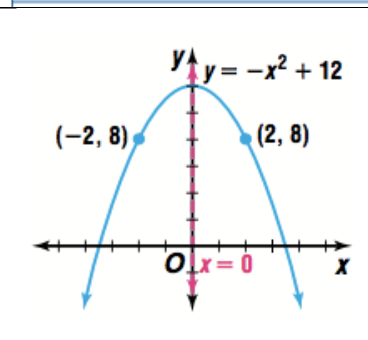
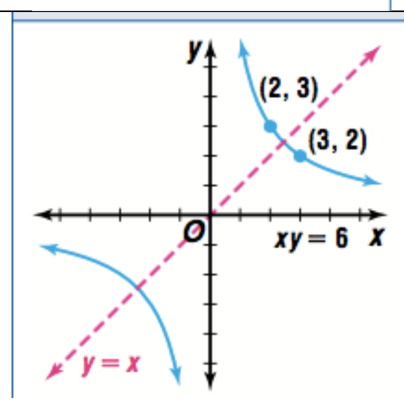
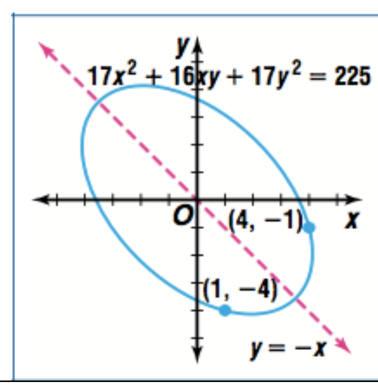
You Try with your partner on whiteboards:
Left column talks, right column writes.

Is $f(x) = x - 5$ *symmetrical around the origin*?

Solve it algebraically.

Given	$f(x) = x^2 - 3$	
Solve for $f(-x)$ *and* $-f(x)$	$f(-x) =$	$-f(x) =$
Check Does $f(-x) = -f(x)$?		

Does the graph have symmetry with respect to..

Symmetry	Test	Example
x-axis	(x,y) => (x,-y)	
y-axis	(x,y)=(-x,y)	
y=x	(x,y)=(y,x)	
y=-x	(x,y)=(-y,-x)	

I Try:

Determine whether the graph of $y = x^2 + 5$ is symmetric with respect to the x-axis, y-axis, y=x, and y=-x.

Symmetry	Test	$y = x^2 + 5$
Rearrange		$y - x^2 = 5$
x-axis	(x,y) => (x,-y)	$y - x^2 \neq -y - x^2$ No
y-axis	(x,y)=>(-x,y)	$y - x^2 = y - (-x)^2$ Yes
y=x	(x,y)=>(y,x)	$y - x^2 \neq x - y^2$ No
y=-x	(x,y)=>(-y,-x)	$y - x^2 \neq -x - (-y)^2$ No

We Try:

Determine whether the graph of $y = -8x$ is symmetric with respect to the x-axis, y-axis, y=x, and y=-x.

Symmetry	Test	$y = -\frac{8}{x}$
Rearrange		
x-axis	(x,y) = (x,-y)	
y-axis	(x,y)=(-x,y)	
y=x	(x,y)=(y,x)	
y=-x	(x,y)=(-y,-x)	

3.2
Families of Graphs
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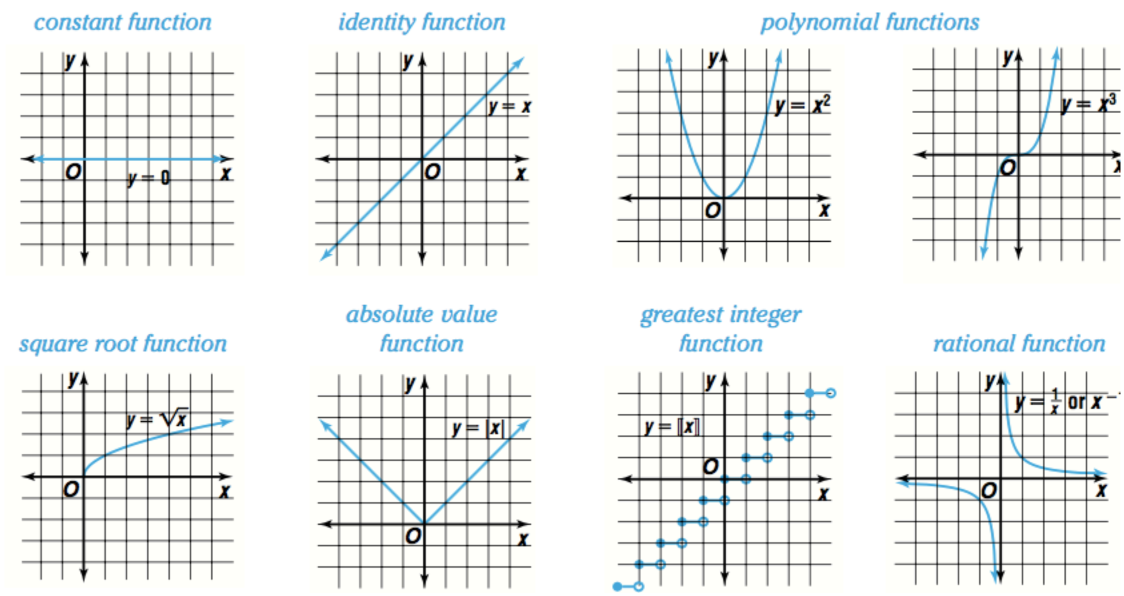
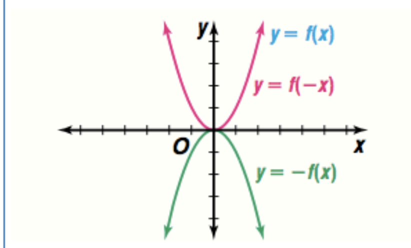
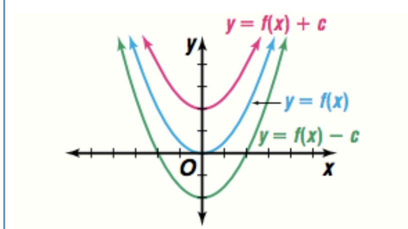
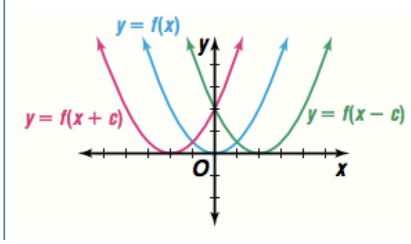
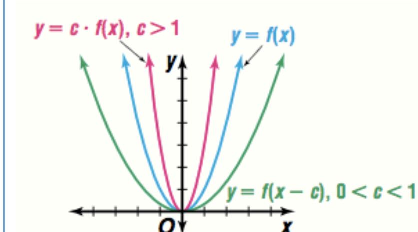
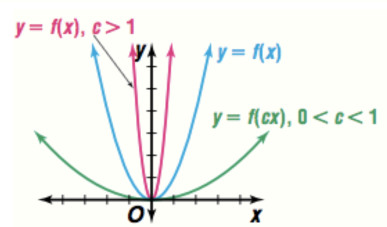


Closure:
Discuss with your partner. Be prepared to share
What are the different tests for symmetry?
Test $xy = 3$
$for\ the\ different\ symmetries.$

Change to the Parent Function $y = f(x)$, $c > 0$	Change to Parent Graph	Examples
Reflections $y = -f(x)$ $y = f(-x)$	Is reflected over the x-axis. Is reflected over the y-axis.	
Translations $y = f(x) + c$ $y = f(x) - c$	Translates the graph c units up. Translates the graph c units down.	
$y = f(x + c)$ $y = f(x - c)$	Translates the graph c units left. Translates the graph c units right.	
Change to the Parent Function $y = f(x)$, $c > 0$	**Change to Parent Graph**	**Examples**
Dilations $y = c \cdot f(x),\ c > 1$ $y = c \cdot f(x),\ 0 < c < 1$	Expands the graph vertically. Compresses the graph vertically.	
$y = f(cx),\ c > 1$ $y = f(cx),\ 0 < c < 1$	Compresses the graph horizontally. Expands the graph horizontally.	

We Try:

18)Describe how the graphs of

$f(x) and\ g(x) are\ related.$

$f(x) = [\![x]\!]$+1

$g(x) = -[\![x]\!]$-1