Assign 1.5: 1-6, 7-18, 27, 28, 31, 32, 34, 35

10/6/16
Pre-Calc

1.5 Transformations

Transformations of functions: horizontal + vertical shifts, dilations, reflections

vertical shift

- $f(x)+a$: shift up by a units
  - ex $f(x)=x^2+2$
  - $g(x)=|x|+4$
- $f(x)-a$: shifts down by a units

horizontal shift

- $f(x+a)$: horizontal shift to the left by a units
  - ex $f(x)=(x+2)^2$
    parent fxn is x^2
  - $f(x)=|x|$, $g(x)=|x+2|$
  - $h(x)=\sqrt{x}$, $m(x)=\sqrt{x+2}$
- $f(x-a)$: horiz. shift to the right by a units
  - ex $f(x)=(x-2)^2$

$\frac{9}{x}$

reflections

$f(-x)$: reflection over y-axis

ex $f(x) = \sqrt{x}$, $g(x) = \sqrt{-x}$

$-f(x)$: reflection over x-axis

ex $f(x) = \sqrt{x}$; $g(x) = -\sqrt{x}$

$af(x)$: vertical dilation

$a > 1$ stretch (thinner)

$1 > a > 0$ compression (wider)

ex $f(x) = x^3$, $g(x) = 2x^3$ $[2f(x)]$

$f(ax)$: horizontal dilation

$a > 1$ compression (thinner)

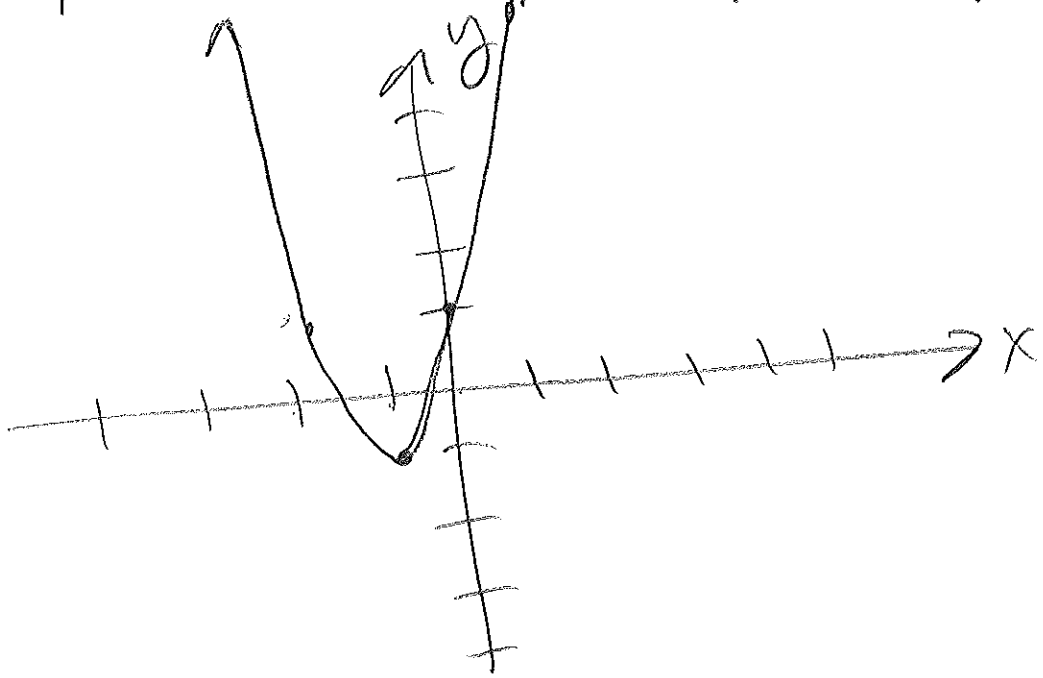
$1 > a > 0$ stretch (wider)

ex $f(x) = x^3$, $g(x) = (2x)^3$ $[f(2x)]$

Graph Transformed fxns

$f(x) = x^2 \Rightarrow g(x) = 2(x+1)^2 - 1$

x	-2	-1	0	1
$g(x)$	$2(-2+1)^2-1$ $2(-1)^2-1$ 1	$2(-1+1)^2-1$	$2(0+1)^2-1$	$2(1+1)^2-1$
y	1	-1	1	7



Rules

		point on graph before transf.	after transf.
Left Shift	$f(x+a)$	(x, y)	$\rightarrow (x-a, y)$
Right Shift	$f(x-a)$	(x, y)	$\rightarrow (x+a, y)$
horiz compression	$f(ax)$	(x, y)	$\rightarrow (\frac{1}{a}x, y)$
vertical dilation	$a f(x)$	(x, y)	$\rightarrow (x, ay)$
horiz stretch	$f(\frac{1}{a}x)$	(x, y)	$\rightarrow (ax, y)$
reflection y-axis	$f(-x)$	(x, y)	$\rightarrow (-x, y)$
reflection x-axis	$-f(x)$	(x, y)	$\rightarrow (x, -y)$

ex) $(2, -4) \xrightarrow{\text{reflection x-axis}} (2, 4)$

$(3, 1) \xrightarrow{\text{V. dilation of 2}} (3, 2)$