HW for March 3 #1 — #9

March 4

Example 2 – Writing Equations of Transformed Functions

1. The function $y = f(x)$ has been transformed into $y = af(k(x-d)) + c$. Write the following in the appropriate form: ↗ a ↗ a is ⊖

   (a) a vertical compression by a factor of $\frac{1}{2}$, a reflection in the x-axis and a translation 3 units ⇒ d right.

   $y = -\frac{1}{2}f(x-3)$

   (b) a vertical stretch by a factor of 3, a horizontal stretch by a factor of 2, a translation left 5 and up 4, and a reflection in the y-axis. $a=3$ $k=-\frac{1}{2}$ $d=5$ $c=4$

   (annotations: =a, ⇒ $k=\frac{1}{2}$)

   $y = 3f(-\frac{1}{2}(x+5))+4$

Practice Transformations Given an Equation

Graph each of the following functions by:

a) Graphing the base function first. $\left(y=x^2, y=\sqrt{x}, y=x^3, y=|x|, y=\frac{1}{x}\right)$ $y=af(k(x-d))+c$

b) Listing the transformations.

c) Applying the transformations to the base function.

$y=x^2$

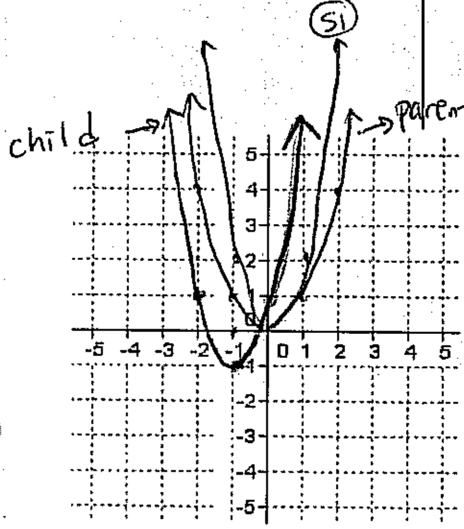
1) $y=2(x+1)^2-1$

$y=2f(x+1)^2-1$

① Vertical stretch by 2

② shift 1 to the left

③ Shift down by 1



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

2) $y=\frac{2}{x+2}+1$

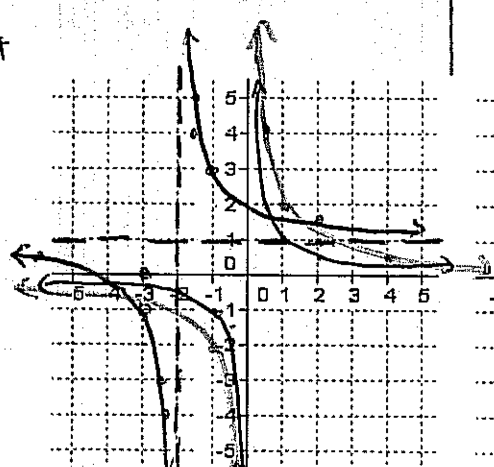
$y= 2f(\frac{1}{(x+2)})+1$

① vertical stretch by 2

② shift 2 to the left

③ shift up 1 unit

affects assymptotes



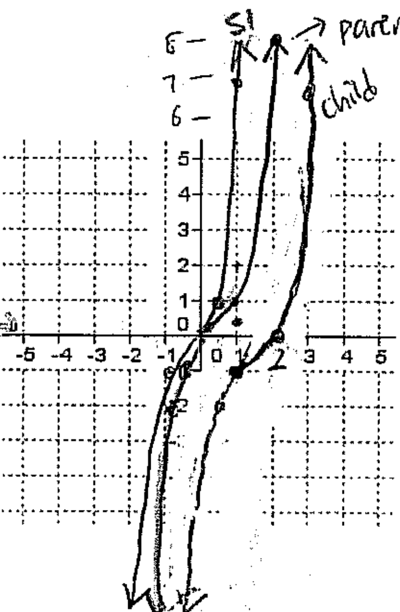
$f(x)=x^3$

3) $y=(2x-2)^3-1$ $y=f(2(x-1))^3-1$

① Horizontal stretch by $\frac{1}{2}$

② shift 1 to the right

③ shift 1 down



parent S1

(0,0) (0,0)

(1,1) ($\frac{1}{2}$,1)

(2,8) (1,8)

(-1,-1) ($-\frac{1}{2}$,-1)

child

(1,-1)

(2,0)

(3,7)

($\frac{1}{2}$,-2)

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

4) $y=-\sqrt{x-2}+1$

$a=-1$ $k=1$ $d=2$

$c=1$

① reflect on x axis

② shift to the right by 2

③ shift up by 1

5) $y=2\sqrt{3x}$

$y=2f(3(x))$

$a=2$, $k=3$, $d=0$, $c=0$

① Vertical stretch by 2.

② horizontal compression by $\frac{1}{3}$

(1, 1) (1, 2) $(\frac{1}{3}, 2)$

(4, 2) (4, 4) $(\frac{1}{3}, 4)$

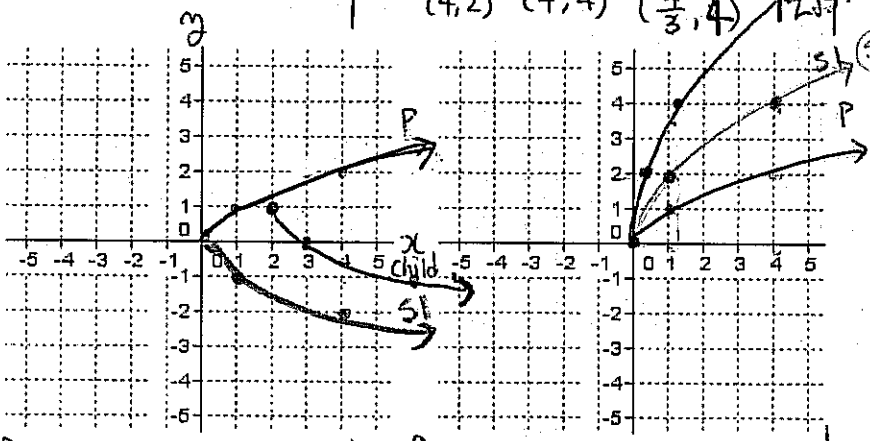
6) $y=3|x+1|+1$

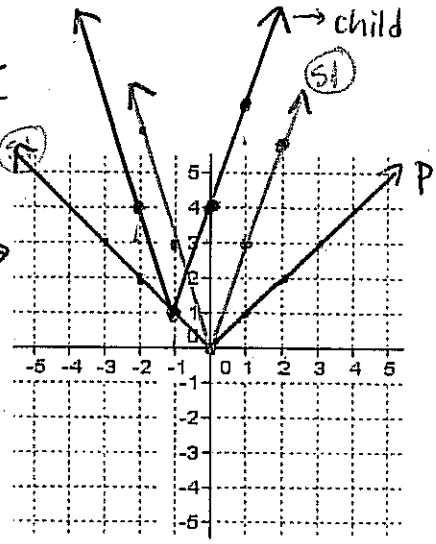
$a=3$, $k=1$, $d=-1$, $c=1$

① Vertical stretch by 3

② shift to the left by 1

③ shift up 1.





$f(x)=|x|$ → parent $f(x)=x^3$ → parent $f(x)=\sqrt{x}$

7) $y=\left|\frac{1}{2}x-\frac{1}{2}\right|$

$y=\left|\frac{1}{2}(x-1)\right|$

$a=1$, $k=\frac{1}{2}$, $d=1$, $c=0$

① Horizontal stretch by 2;

② shift 1 to the right

P	S1	child
(0, 0)	(0, 0)	(1, 0)
(1, 1)	(2, 1)	(3, 1)
(2, 2)	(4, 2)	(5, 2)

8) $y=-\left(-\frac{1}{2}(x+1)\right)^3$ $c=0$

$a=-1$, $k=-\frac{1}{2}$, $d=-1$

① reflect it on x axis

② reflect it on y axis and horizontal stretch by 2

③ shift to the left by 1

9) $y=2\sqrt{2x+2}+2$ $y=2\sqrt{2(x+1)}+2$

$y=2f(2(x+1))+$

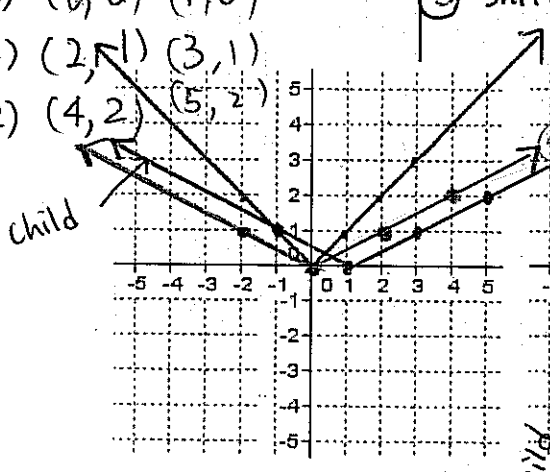
$a=2$, $k=2$, $d=-1$ $c=2$

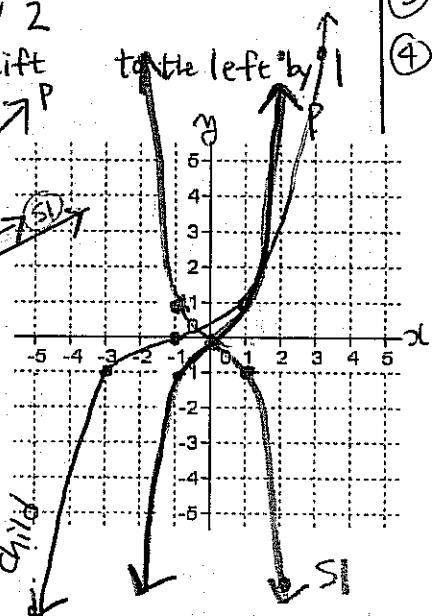
① Vertical stretch by 2

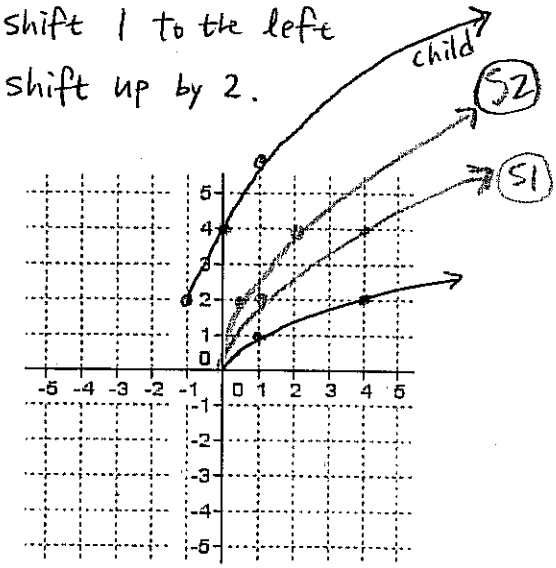
② horizontal Compression by $\frac{1}{2}$

③ shift 1 to the left

④ shift up by 2.







Practice Transformations Given a Graph

List the transformations.

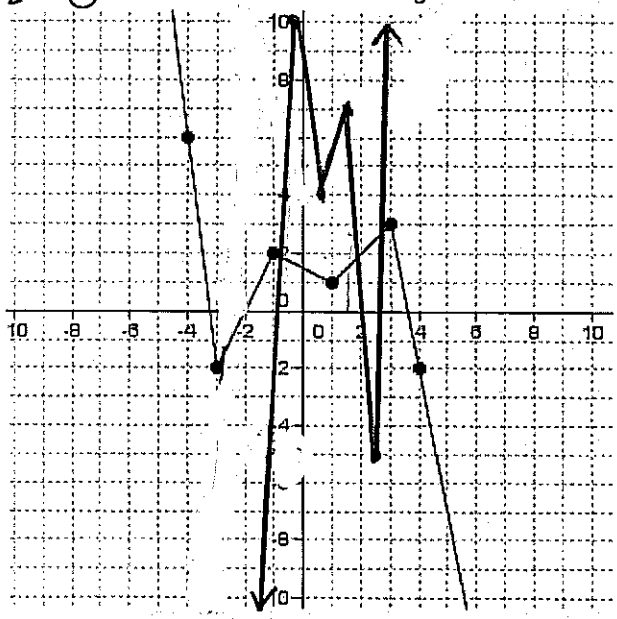
Apply the transformations to key points on the graph.

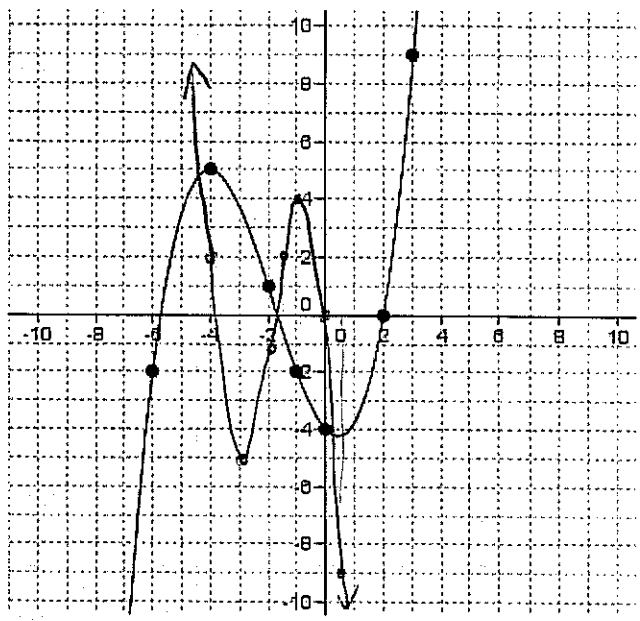
1) $y=3g(-2(x-1))+1$ $a=3$, $k=-2$, $d=1$, $c=1$

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

① Vertically stretch by 3.

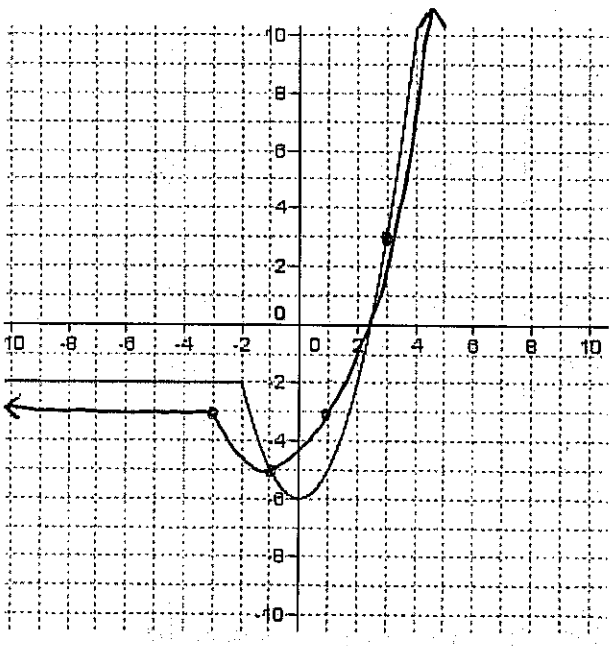
② reflect it on y axis and horizontally compressed by $\frac{1}{2}$ ③ shift 1 to the right and 1 up.

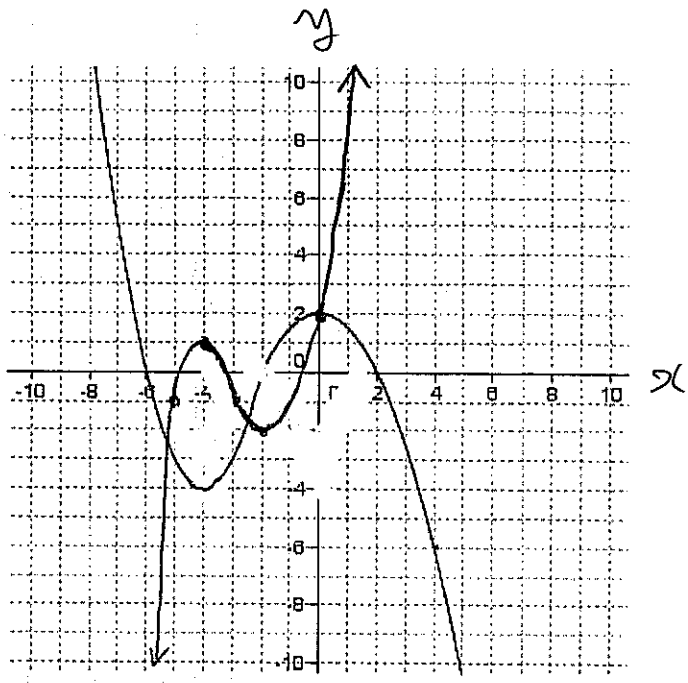




3) $y=\frac{1}{2}h(x+1)-2$

4) $y=-\frac{1}{2}f(2x+4)-1$





1) $y = 3g(-2(x-1)) + 1$

$a = 3, \quad k = -2, \quad d = 1, \quad c = 1$

① Vertically stretch by 3.

② Reflect it on y axis and horizontally compress by $\frac{1}{2}$

③ Shift 1 to the right and 1 up.

Parent	S1	S2	S2.5	S3
$(-4, 6)$	$(-4, 18)$	$(4, 18)$	$(2\ 18)$	$(3, 19)$
$(-3, -2)$	$(-3, -6)$	$(3, -6)$	$(\frac{3}{2}\ -6)$	$(2.5, -5)$
$(-1, 2)$	$(-1, 6)$	$(1, 6)$	$(\frac{1}{2}\ 6)$	$(1.5, 7)$
$(1, 1)$	$(1, 3)$	$(-1, 3)$	$(-\frac{1}{2}\ 3)$	$(0.5, 4)$
$(3, 3)$	$(3, 9)$	$(-3, 9)$	$(-\frac{3}{2}\ 9)$	$(-0.5, 10)$
$(4, -2)$	$(4, -6)$	$(-4, -6)$	$(-2\ -6)$	$(-1, -5)$

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

$a = -1, \quad k = 2, \quad d = -1, \quad c = 0$

Parent	S1	S2	S3
$(-6, -2)$	$(-6, 2)$	$(-3, 2)$	$(-4, 2)$
$(-4, 5)$	$(-4, -5)$	$(-2, -5)$	$(-3, -5)$
$(-2, 1)$	$(-2, -1)$	$(-1, -1)$	$(-2, -1)$
$(-1, -2)$	$(-1, 2)$	$(-\frac{1}{2}, 2)$	$(-1.5, 2)$
$(0, -4)$	$(0, 4)$	$(0, 4)$	$(-1, 4)$
$(2, 0)$	$(2, 0)$	$(1, 0)$	$(0, 0)$
$(3, 9)$	$(3, -9)$	$(\frac{3}{2}, -9)$	$(0.5, -9)$

① reflect it on x axis

② horizontal compression by $\frac{1}{2}$

③ shift to the left by 1

3) $y = \frac{1}{2} h(x+1) - 2$ $\quad a = \frac{1}{2},\ d = -1,\ c = -2$

① Vertically compress it by $\frac{1}{2}$.
② shift to the left by 1 and down by 2.

Parent	S1	S2
(−2, −2)	(−2, −1)	(−3, −3)
(0, −6)	(0, −3)	(−1, −5)
(2, −2)	(2, −1)	(1, −3)
(4, 10)	(4, 5)	(3, 3)

4) $y = -\frac{1}{2} f(2x+4) - 1$ $\quad a = -\frac{1}{2},\ k = 2,\ d = -2,$

$y = -\frac{1}{2} f(2(x+2)) - 1$ $\quad c = -1$

① reflect it on x axis and vertically compress by $\frac{1}{2}$
② Horizontal compression by $\frac{1}{2}$
③ Shift to the left by 2 and down by 1

Parent	S1	S2	S3
−6, 0	−6, 0	−3, 0	−5, −1
−4, −4	−4, +2	−2, +2	−4, 1
−2, 0	−2, 0	−1, 0	−3, −1
0, 2	0, −1	0, −1	−2, −2
4, −6	+4, +3	+2, +3	0, 2