2.5D HSRV II: Shapes

A. Introduction

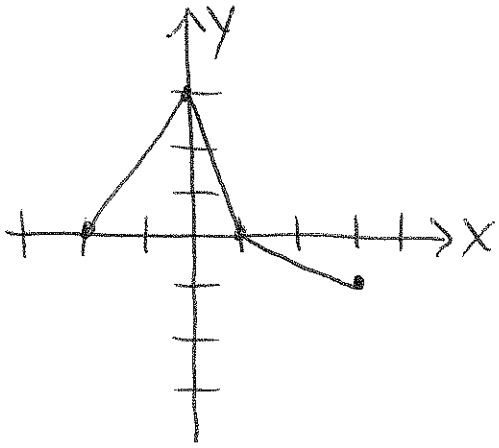
Sometimes you are not given the output formula of the original base graph, i.e. you are only given "a shape". To transform these, we identify key points, i.e. "corners", and use the transformation rules for coordinates.

B. Method

1. Make a table listing the key points (i.e. corners) of the base graph.
2. Do HSRV, one transformation at a time, creating a "new column" in the table. Get the new column from rules for coordinates.
3. Continue making new columns and transforming the shape until you finish with V. This is the answer.

C. Example

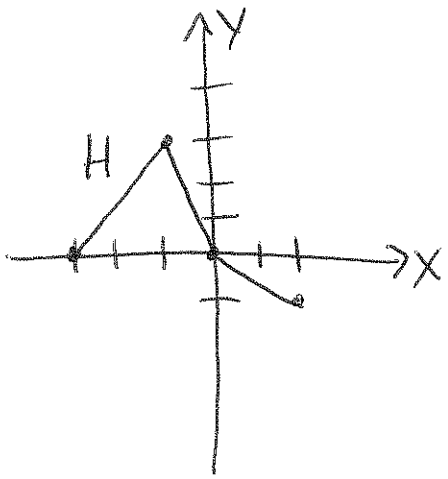
The graph of f is given by



Graph g, where $g(x) = 2 - \frac{1}{2} f\left(-\frac{1}{2}x + 1\right)$

Solution

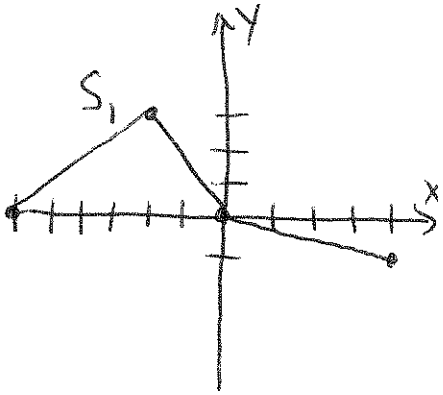
Base Graph	H
$(-2,0)$	$(-3,0)$
$(0,3)$	$(-1,3)$
$(1,0)$	$(0,0)$
$(3,-1)$	$(2,-1)$



$y=f(x) \longmapsto y=f(x+1)$

move graph left by 1
x-values -1
y-values fixed

H	S_1 (horizontal)
$(-3,0)$	$(-6,0)$
$(-1,3)$	$(-2,3)$
$(0,0)$	$(0,0)$
$(2,-1)$	$(4,-1)$

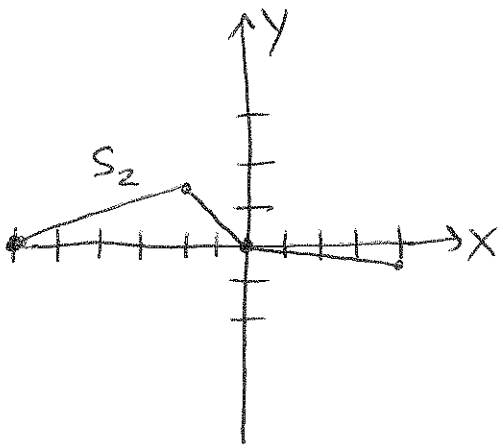


$y=f(x+1) \longmapsto y=f(\frac{1}{2}x+1)$

horizontal stretch by 2 (reciprocal!)
x-values times 2
y-values fixed

S_1 (horizontal)
$(-6,0)$
$(-2,3)$
$(0,0)$
$(4,-1)$

S_2 (vertical)
$(-6,0)$
$(-2,\frac{3}{2})$
$(0,0)$
$(4,-\frac{1}{2})$

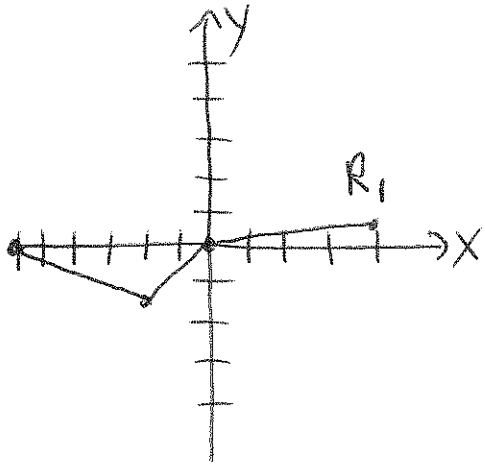


$y=f(\frac{1}{2}x+1) \longmapsto y=\frac{1}{2}f(\frac{1}{2}x+1)$

vertical shrink by $\frac{1}{2}$
x-values fixed
y-values times $\frac{1}{2}$

S_2 (vertical)
$(-6,0)$
$(-2,\frac{3}{2})$
$(0,0)$
$(4,-\frac{1}{2})$

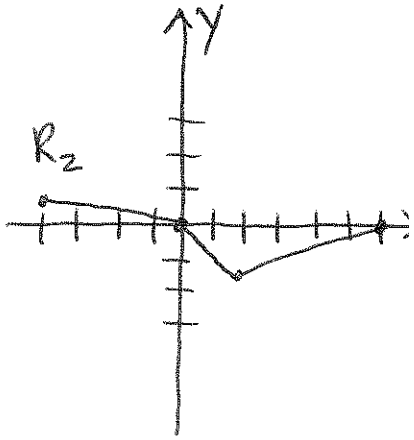
R_1 (x-axis)
$(-6,0)$
$(-2,-\frac{3}{2})$
$(0,0)$
$(4,\frac{1}{2})$



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

x-axis reflection
x-values fixed
y-values times -1

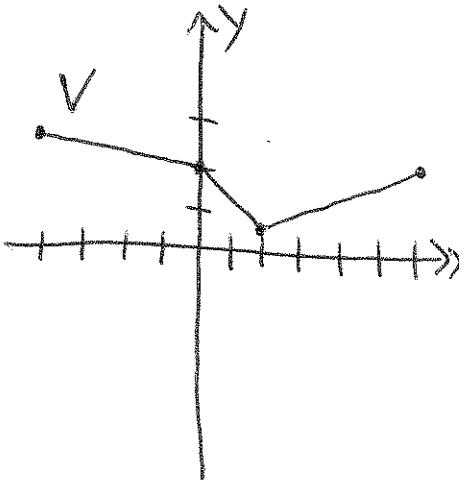
R_1 (x-axis)	R_2 (y-axis)
$(-6,0)$	$(6,0)$
$(-2,-\frac{3}{2})$	$(2,-\frac{3}{2})$
$(0,0)$	$(0,0)$
$(4,\frac{1}{2})$	$(-4,\frac{1}{2})$



$$y=-\tfrac{1}{2}f\left(\tfrac{1}{2}x+1\right) \longmapsto y=-\tfrac{1}{2}f\left(-\tfrac{1}{2}x+1\right)$$

↑ y-axis reflection
x-values times -1
y-values fixed

R_2 (y-axis)	V
$(6,0)$	$(6,2)$
$(2,-\frac{3}{2})$	$(2,\frac{1}{2})$
$(0,0)$	$(0,2)$
$(-4,\frac{1}{2})$	$(-4,\frac{5}{2})$



$$y=-\tfrac{1}{2}f\left(-\tfrac{1}{2}x+1\right) \longmapsto y=-\tfrac{1}{2}f\left(-\tfrac{1}{2}x+1\right)+2$$
$$=2-\tfrac{1}{2}f\left(-\tfrac{1}{2}x+1\right)$$

↑ move graph up 2
x-values fixed
y-values +2

↑ This is the final answer!