A2: Transformations Day 2

Function Transformations

$$y = af\left(b(x-h)\right)+k$$

Types of Transformations

- Shifts (vertical and horizontal)
- Dilations (vertical and horizontal)
- Reflections (about the x-axis, y-axis and origin)
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Review: Identify the parent function. Then, describe the transformations from the parent function.

a) $f(x) = \lvert x-1\rvert + 3$	b) $f(x) = -(x+1)^2$	c) $f(x) = \sqrt[3]{x-2}+1$	d) $f(x) = 3 - [\![x+7]\!]$
Abs. value right 1; up 3	Quad. left 1 reflect x-axis	cube root right 2 up 1	greatest integer left 7 up 3 reflect x-axis

Dilations

Vertical Consider: a	Horizontal Consider: b
$\lvert a\rvert > 1$ vertical stretch (expand vert. by factor of a)	$\lvert b\rvert > 1$ horiz. shrink (compress horiz. by factor of b)
$\lvert a\rvert < 1$ vertical shrink (compress vert. by factor of 1/a)	$\lvert b\rvert < 1$ horiz. stretch (expand horiz. by factor of 1/b)

Transform the given function f(x) as described and write the resulting function as an equation.

a) $f(x)$: greatest integer function translated up 2; right 6 expand vertically by a factor of 4	b) $f(x) = x^2$ translated down 8 compress horizontally by factor of 2
$f(x) = 4[(x-6)] + 2$	$f(x) = (2x)^2 - 8$

Describe the transformations necessary to transform the graph of f(x) into that of g(x).

a) $f(x) = \frac{1}{x}$ $g(x) = \frac{2}{x-5}+3$	b) $f(x) = \lvert x\rvert$ $g(x) = \frac{1}{3}\lvert x-1\rvert + 3$
reciprocal right 5 up 3 a = 2 expand vertically by factor of 2	Abs. value right 1 up 3 compress vert. by factor of 3
c) $f(x) = \sqrt[3]{x}$ $g(x) = \sqrt[3]{\frac{1}{4}x} - 2$	**d)** $f(x) = [x]$ $g(x) = 3\left[\frac{1}{8}(x+2)\right]$
cube root down 2 expand horiz. factor of 4	greatest integer left 2 expand vert. by 3 expand horiz by 8

Reflections

About the x-axis a<o	About the y-axis b<o	About the origin a<o & b<o

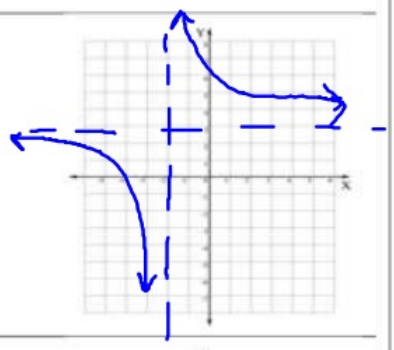
Describe the transformations necessary to transform the graph of f(x) into that of g(x).

a) $f(x)=\frac{1}{x}$ $g(x)=\frac{-1}{3(x-5)}$ a = -1; refect w/ x-axis b = 3; horiz compression by factor of 3 right 5	b) $f(x)=\sqrt[3]{x}$ $g(x)=\sqrt[3]{-(x+3)}-1$ left 3 down 1 reflect w/ y-axis	c) $f(x)=[x]$ $g(x)=-[-2(x+1)]$ left 1 reflect about origin horiz. compression factor of 2

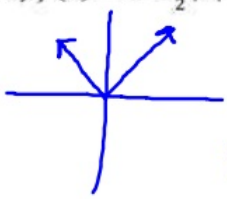
Describe the transformations from the parent function then sketch the function. State the D/R in any notation.

a) $f(x)=\frac{1}{x+2}+3$

up 3 (HA) y = 3
left 2 (VA) x = -2

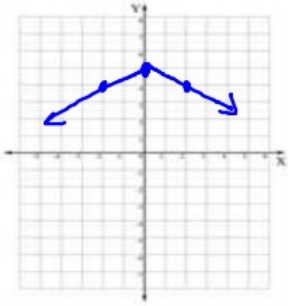


b) $f(x)=5-\frac{1}{2}|x|$

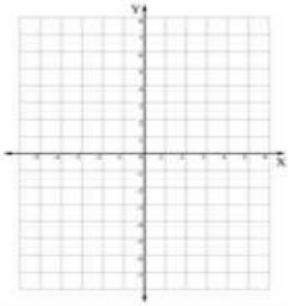


up 5
vertical compression by 2
reflect w/ x-axis
D: $(-\infty,\infty)$
R: $(-\infty,5]$

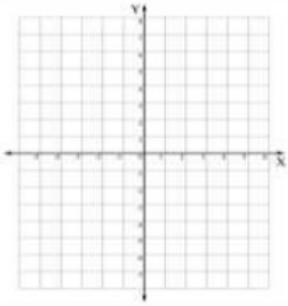
x	y
-2	4
0	5
2	4



c) $f(x)=\sqrt{-3(x-2)}$

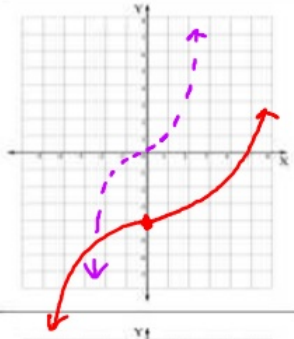


d) $f(x) = -\frac{1}{3}(x-4)^2 + 1$

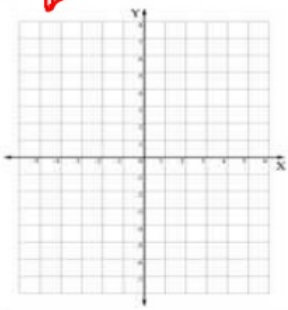


e) $f(x) = \frac{1}{3}x^3 - 4$

down 4
vertical compression
by factor of 3
D: $(-\infty, \infty)$
R: $(-\infty, \infty)$



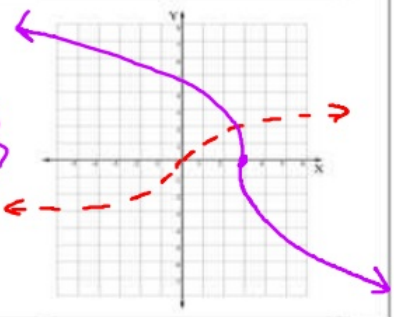
f) $f(x) = -\sqrt{-x} + 1$



g) $f(x) = 2\sqrt[3]{-(x-3)}$

vertical expand by factor of 2
reflect wrt y-axis
right 3

D: $\{x \mid x \in R\}$
R: $\{y \mid y \in R\}$



h) $f(x) = |3(x+1)| + 1$