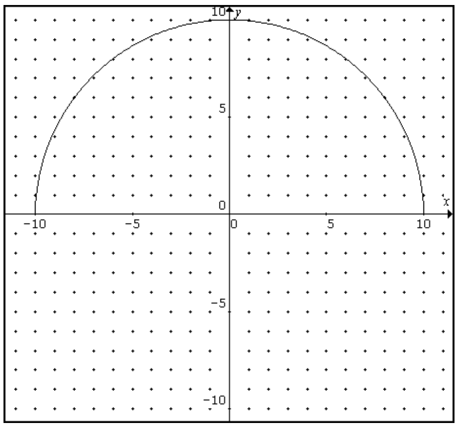
Horizontal Transformations (Answers)

Date:

An additional transformation of a graph can be applied using a 'k' value. In function notation this value is applied as follows:

$$y = f(x) \text{ becomes } y = f(kx).$$

The impact of this k value can be shown on the graph of a semi-circle. The graph shown is the "upper half" of the circle $x^2 + y^2 = 100$.



Write the equation of the graph in function notation.

$$\boxed{f(x) = \sqrt{100 - x^2}}$$

Write the equation of $f(2x)$ and evaluate enough points to sketch the graph.

$$\boxed{f(2x) = \sqrt{100 - 4x^2}}$$

x	-10	-8	-6				0				6	8	10
$f(x)$	**0**	**6**	**8**				**10**				**8**	**6**	**0**
$2x$				**-5**	**-4**	**-3**	**0**	**3**	**4**	**5**			
$f(2x)$				**0**	**6**	**8**	**10**	**8**	**6**	**0**			

Given that $y = f(kx)$, state the effect on the graph of $y = f(x)$ if:

(i) $k < 0$ **reflected in the *y*-axis**

(ii) $|k| > 1$ **compressed horizontally by *k***

(iii) $|k| < 1$ **expanded horizontally by** $\frac{1}{k}$

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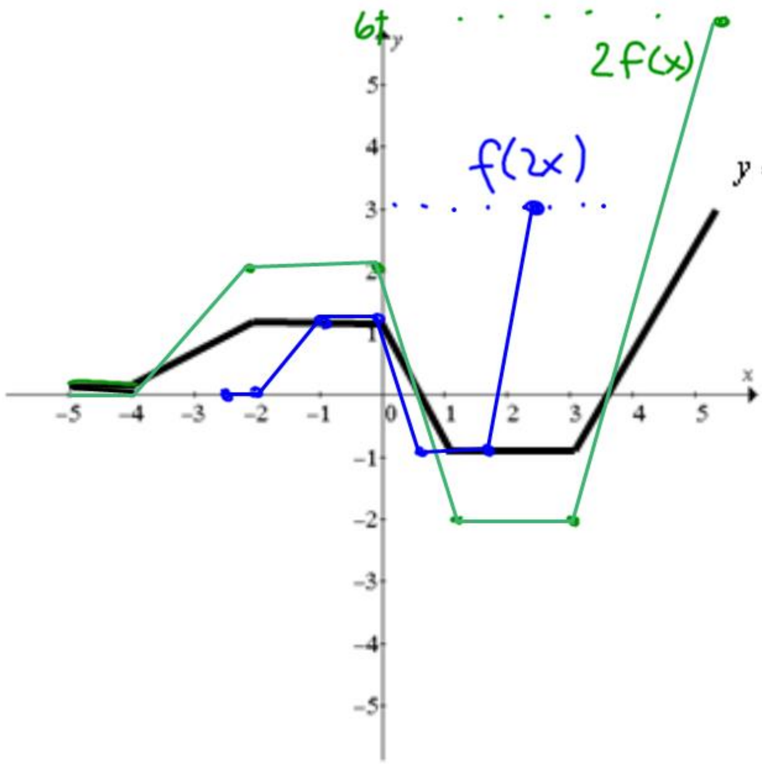
The graph of $y = f(x)$ is shown below.

State: D_f $-5 \le x \le 5$ and R_f $-1 \le y \le 3$

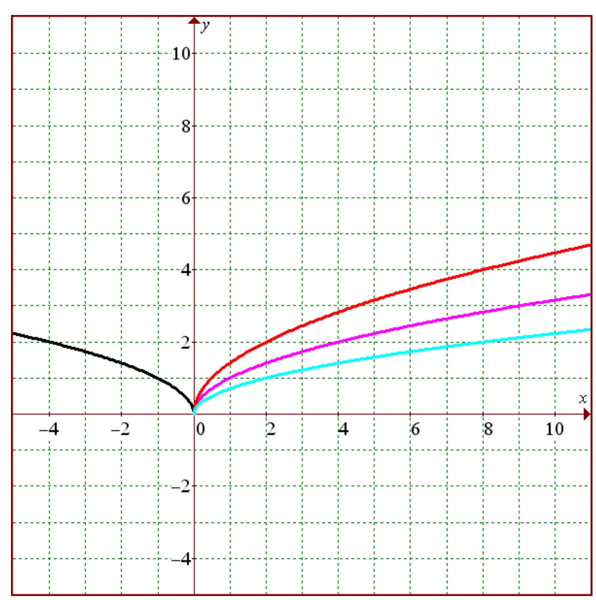


On the same set of axes, sketch $y = 2f(x)$ and $y = f(2x)$.

For $y = 2f(x)$ State: D ____________ and R ____________.

For $y = f(2x)$ State: D ____________ and R ____________.

1. On the axes provided, sketch $f(x) = \sqrt{x}$.
   On the same axes, sketch and label:
   (i) $f(-x)$
   (ii) $f(2x)$
   (iii) $f(\frac{1}{2}x)$



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2. Create equations for the given values:

$y=f(x)$	a	k	p	q	Equation
$y=\lvert x\rvert$	1	1	3	-2	$y=\lvert x-3\rvert-2$
$y=x^2$	½	1	-2	3	$y=\frac{1}{2}(x+2)^2+3$
$y=\sqrt{x}$	1	½	3	0	$y=\sqrt{\frac{1}{2}(x-3)}$
$y=\sqrt{x}$	-1	3	-2	1	$y=-\sqrt{3(x+2)}+1$
$y=\frac{1}{x}$	-2	3	0	0	$y=\frac{-2}{3x}$
$y=\frac{1}{x}$	3	1	-1	1	$y=\frac{3}{x+1}+1$
$y=x^3$	1	1	2	-3	$y=(x-2)^3-3$
$y=\lvert x\rvert$	-2	1	0	-2	$y=-2\lvert x\rvert-2$

3. Describe, in detail, the transformations on the graph of a function $y=g(x)$ needed to produce:

a) $y=g(x-4)$ shift 4 to the right

b) $y=5g(x)$ vertical stretch by 5

c) $y=g(x)-5$ shift down by 5

d) $y=g(\frac{1}{4}x)$ horizontal stretch by $\frac{1}{4}$ or horizontal compression by 4

e) $y=g(x-2)-1$ shift right by 2 and shift down by 1

f) $y=3g(x+1)$ vertically stretch by 3 and translate left by 1

g) $y=2-g(x)$ reflect in the *x*-axis then translate up by 2

h) $y=g(-2x)$ reflect in the *y*-axis and compress horizontally by 2

i) $y=\frac{1}{4}g(x)+2$ vertically compress by 4 then shift up by 2

j) $y=g(1-x)$ reflect in horizontally then translate to the right by 1

k) $y=g(\frac{x}{3}-2)$ stretch horizontally by 3 then translate to the right by 6

l) $y=3-3g(2x)$ vertically stretched & reflected by 3, horizontally compressed by 2, then translated up by 3