

## Transformations

### Pull It Together

Video Starts here ...

We are at the end of the Cycle, and the next Task is to

- complete "Check Your Learning Cycle 3"
- it will be posted Tuesday May 5th
- due end of day Thursday May 7th
- no exceptions.

Today we have Pulled Together some questions and solutions to help you fully understand Transformations.

Are You Getting it ...

Pause the video,

A pdf is provided, print it if you can or just copy it

Complete these questions, when done, restart the video and Mrs Major will go through the solutions.

*Transformations of Functions*  
*Are You Getting It?*

The following graphs are of  $f(x)$ .  
Describe the transformation to be applied to  $f(x)$  to arrive at  $g(x)$ .  
Then draw the graph of  $g(x)$  as defined in each question.

1.  $g(x) = 2f(x)$  Transformation = \_\_\_\_\_

2.  $g(x) = f(2x)$  Transformation = \_\_\_\_\_

3.  $g(x) = f\left(\frac{1}{2}x\right)$  Transformation = \_\_\_\_\_

a

↓

1.  $g(x) = 2f(x)$  Transformation = V. stretch by 2

$k$   
↓

2.  $g(x) = f(2x)$       Transformation = H. Compression by  $\frac{1}{2}$

$k$   
→

3.  $g(x) = f\left(\frac{1}{2}x\right)$       Transformation = H. Stretch by 2

$$1 \div k$$

$$= 1 \div \frac{1}{2}$$

$$= 1 \times \frac{2}{1}$$

$$= 2$$

## Correct Terminology is Important

The Video ends here.

Continue through the remaining questions, full solutions are provided - but give each question a good try FIRST.

4. Explain what transformations you would need to apply to the graph of

**K**  $y = f(x)$  to graph each function.

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

b)  $y = f(x - 2) + 3$       d)  $y = -f\left(\frac{1}{2}x\right) - 2$       f)  $y = 4f(-x) - 4$

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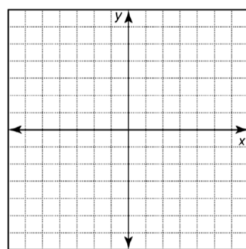
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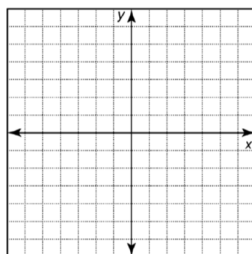
4. a) Vertical stretch, factor 3, then translation 1 unit down  
 b) Translation 2 units right and 3 units up  
 c) Horizontal compression, factor  $\frac{1}{2}$ , then translation 5 units down  
 d) Reflection in  $x$ -axis, horizontal stretch with factor 2, and then translation 2 units down  
 e) Vertical compression, factor  $\frac{2}{3}$ , then translation 3 units left and 1 unit up  
 f) Vertical stretch with factor 4, reflection in  $y$ -axis, and then translation 4 units down

Determine ALL the transformations and then complete them Step-by-Step.

12. For  $f(x) = \sqrt{x}$ , sketch the graph of  $h(x) = f(-3x - 12)$ .



11. For  $f(x) = x^2$ , sketch the graph of  $g(x) = f(2x + 6)$ .



**BIG HINT - FACTOR OUT THE K**

$$g(x) = a f(k(x-d)) + c$$

12. For  $f(x) = \sqrt{x}$ , sketch the graph of  $h(x) = f(-3x - 12)$ .

$$h(x) = f(-3(x+4))$$

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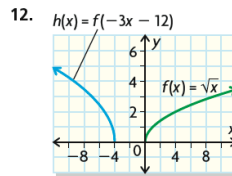
$$h(x) = f(-3(x+4))$$

a=1

k=-3

d=-4

c=0



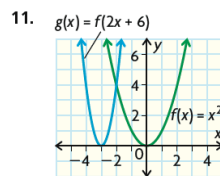
11. For  $f(x) = x^2$ , sketch the graph of  $g(x) = f(2x + 6)$ .

a=1

k=2

c=-3

c=0



**This question uses the correct words  
you need to know them**

19. The function  $y = f(x)$  has been transformed to  $y = af[k(x - d)] + c$ . Determine  $a$ ,  $k$ ,  $c$ , and  $d$ ; sketch the graph; and state the domain and range for each transformation.

a) A vertical stretch by the factor 2, a reflection in the  $x$ -axis, and a translation 4 units right are applied to  $y = \sqrt{x}$ .

b) A vertical compression by the factor  $\frac{1}{2}$ , a reflection in the  $y$ -axis, a translation 3 units left, and a translation 4 units down are applied to

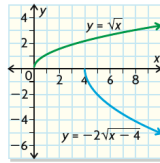
$$f(x) = \frac{1}{x}$$

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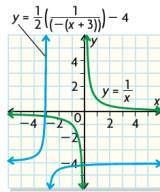
- a) A vertical stretch by the factor 2, a reflection in the  $x$ -axis, and a translation 4 units right are applied to  $y = \sqrt{x}$ .
- b) A vertical compression by the factor  $\frac{1}{2}$ , a reflection in the  $y$ -axis, a translation 3 units left, and a translation 4 units down are applied to  $f(x) = \frac{1}{x}$ .

19. a)  $a = -2, k = 1, c = 0, d = 4$



domain =  $\{x \in \mathbf{R} \mid x \geq 4\}$ , range =  $\{y \in \mathbf{R} \mid y \leq 0\}$

b)  $a = \frac{1}{2}, k = -1, c = -3, d = -4$



domain =  $\{x \in \mathbf{R} \mid x \neq -3\}$ , range =  $\{y \in \mathbf{R} \mid y \neq -4\}$

### Applying Transformations to Quadratic Functions

20. If  $f(x) = (x - 2)(x + 5)$ , determine the  $x$ -intercepts for each function.

- a)  $y = f(x)$                       c)  $y = f\left(-\frac{1}{3}x\right)$
- b)  $y = -4f(x)$                     d)  $y = f(-(x + 2))$





Horizontal Stretch / Compression ??

Reflection on Which Axis ??

8. In each graph, one of the parent functions  $f(x) = x^2$ ,  $f(x) = \sqrt{x}$ ,  $f(x) = \frac{1}{x}$ , has undergone a transformation of the form  $f(kx)$ . Determine the equations of the transformed functions graphed in red.

b)

c)

b)

d)

Horizontal Stretch / Compression ??

Reflection on Which Axis ??

8. In each graph, one of the parent functions  $f(x) = x^2$ ,  $f(x) = \sqrt{x}$ ,  $f(x) = \frac{1}{x}$ , has undergone a transformation of the form  $f(kx)$ . Determine the equations of the transformed functions graphed in red.

b)

c)

Horizontal Stretch  
(x4)  $\rightarrow k = \frac{1}{4}$   
 $g(x) = (\frac{1}{4}x)^2$

b)

d)

Reflection on y axis  $\rightarrow k = -1$   
 $f(x) = \frac{1}{-x} = -\frac{1}{x}$

Reflection on y  
Compress ( $x \frac{1}{3}$ )  
 $f(x) = \sqrt{3x}$

