Name: ______________________________ Date: ____________________ Period: ______

PRE-CALCULUS 12

Chapter 1 Review

NOTES & BASIC EXERCISES

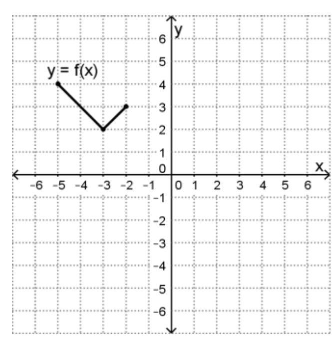
This review package is based on **Chapter 1 Polynomial Functions** from the *Pre-calculus 12* student workbook and textbook.

- Read over the given notes for each section or group of sections.
- Complete the sample review questions for each section or group of sections, and check your answers with those in the answer key.
  (NOTE: these are basic review questions, which may be a bit easier than similar ones on the test.)
- Ensure that you have completed the exercises assigned in previous classes.
- Also, complete the listed review questions from the *Pre-calculus 12* textbook.

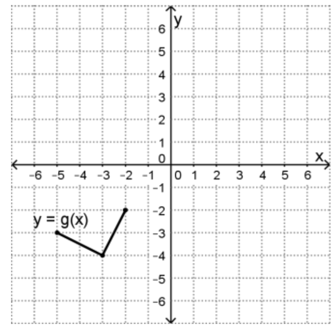
1.1 Horizontal and Vertical Translations
1.2 Stretches and Reflections
1.3 Combining Transformations

- When transformations are applied to a function, an equation of a function like $y = f(x)$ can become $y = a\,f(b(x-h))+k$, where *a*, *b*, *h*, and *k* are real numbers.
- If $a \neq \pm 1$ then the graph will be vertically stretched about the *x*-axis by a factor of $|a|$.
  Also, If *a* is negative, then the graph wlll be reflected in the *x*-axis.
- If $b \neq \pm 1$ then the graph will be horizontally stretched about the *y*-axis by a factor of $\left|\frac{1}{b}\right|$.
  Also, If *b* is negative, then the graph wlll be reflected in the *y*-axis.
- If $h \neq 0$ then the graph will be horizontally shifted *h* units to the right if *h* is positive, and *h* units to the left if *h* is negative.
- If $k \neq 0$ then the graph will be horizontally shifted *k* units upwards if *k* is positive, and *k* units downwards if *k* is negative.
- The mapping of points on the graph of $y = f(x)$ to the graph of $y = a\,f(b(x-h))+k$ will look like $(x, y) \rightarrow \left(\frac{1}{b}x+h, ay+k\right)$

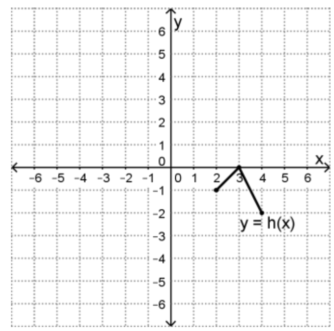
1. To the right is a grid with the graph of $y = f(x)$. On the same grid draw the graphs of the following functions.
   $y = f(x)+3$
   $y = f(x-9)$
   $y = f(x+1)-5$



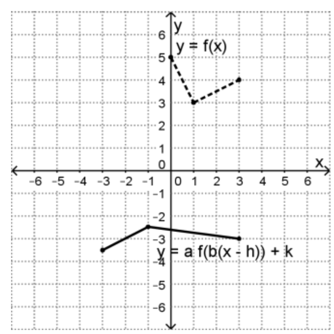
2. To the right is a grid with the graph of $y=g(x)$. On the same grid draw the graphs of the following functions.
   $y=-g(x)$
   $y=g(-x)$
   $y=-g(-x)$



3. To the right is a grid with the graph of $y=h(x)$. On the same grid draw the graphs of the following functions.
   $y=-\frac{1}{2}h(x-3)+1$
   $y-5=3h(4-2x)$



4. To the right is a grid with the graphs of $y=f(x)$ and a version with transformations, $y=af(b(x-h))+k$. Rewrite $y=af(b(x-h))+k$ with numbers that reflect the actual transformations.



5. List all of the transformations that would have to be done to $y=f(x)$ to get $y=\frac{3}{2}f(-\frac{1}{4}(x-7))+1$. Also, create a mapping that describes the combine transformations.

6. List all of the transformations that would have to be done to $y=g(x)$ to get $y+5=-2.5\,g(9+2x)$. Also, create a mapping that describes the combined transformations.

7. Suppose that point $(4,-5)$ is on the graph of $y=h(x)$. What point will it become on the graph of $y=2h\left(-\frac{1}{2}(x-3)\right)+10$.

8. Suppose that point $(8,3)$ is on the graph of $y=f(x)$. What point will it get mapped onto on the graph of $y=-3f\left(-10+4x\right)-8$.

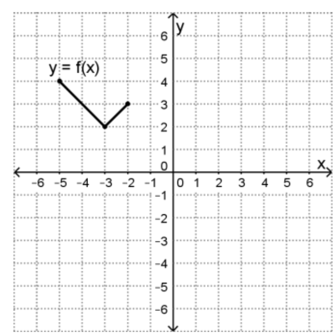
9. Suppose that $f(x)=5x-2$. Write the transformed function $2f(-2x+4)+1$ in simplest form.

10. Suppose that $g(x)=2x^2-3x$. Write the transformed function $-3g(6-x)-4$ in simplest form.

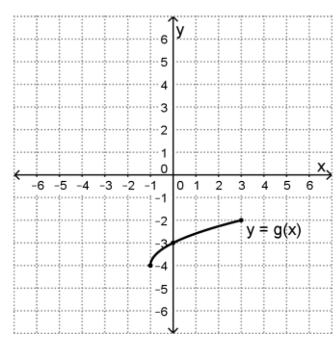
1.4 Inverse of a Relation

- The mapping $(x,y)\rightarrow(y,x)$ describes going from a relation to the inverse of the relation.
- The graph of an inverse relation will be the graph of the original relation reflected in the line $y=x$.
- The range of the inverse relation of a function will be the same as the domain of the original function, and the domain of the inverse relation of a function will be the same as the range of the original function.
- If the inverse relation of a function *f* is also a function, then it is called an inverse function and will be referred to as f^{-1}.

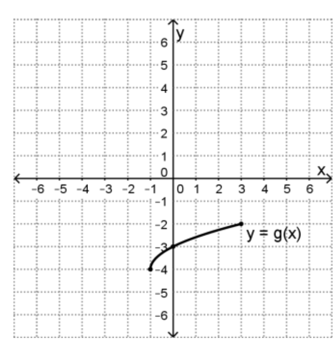
1. To the right is a grid with the graph of $y=f(x)$. On the same grid draw the graph of the inverse relation of function *f*. Is the inverse also a function?



2. To the right is a grid with the graph of $y=g(x)$. On the same grid draw the graph of $y=g^{-1}(x)$. Also, write out the domain and range of both *g* and g^{-1}.



3. To the right is a grid with the graph of $y=g(x)$. On the same grid draw the graph of $y=2g^{-1}(-x-5)+1$.



Chapter 1 Exercises Assigned in Previous Classes

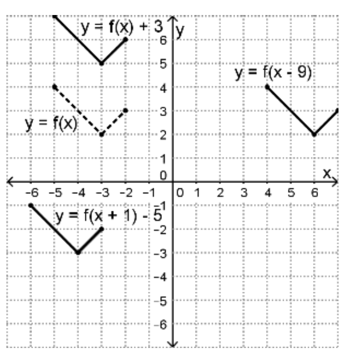
- From pages 12 to 15 in **1.1 Vertical and Horizontal Translations**:
  #1, #2, #3, #4, #5, #6, #7, #8, #9, #10, #11, #12, #13, #16, and (optionally #18 and #19).
- From pages 28 to 31 in **1.2 Stretches and Reflections**:
  #1, #2, #3, #5, #6, #7, #8, #9, #10, #12, and #13 (and, optionally, #14 and #15).
- From pages 38 to 41 in **1.3 Combining Transformations**:
  #1, #2, #3, #4, #5, #6 (b,d,e), #7 (b,d,f), #8, #9 (b,e,f), #10, #11 (b), #12, #14, and try #15
- From pages 51 to 54 in **1.4 Inverse Relations**:
  #1, #2, #3, #4, #5, #6, #7, #8, #9 (a,c,e), #10 (a), #11, #12 (c,e), #13 (b,e), #14, #15, #16, and try #19.

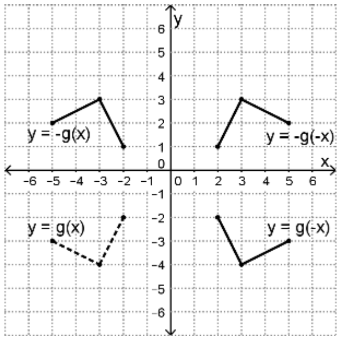
Other Chapter 1 Review Exercises Worth Doing

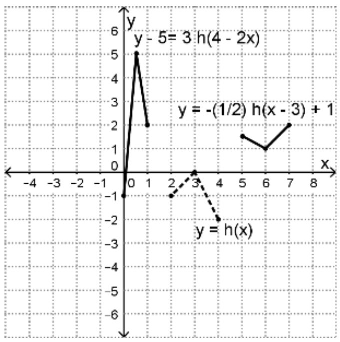
- Complete the **Chapter 1 Review** exercises #1 to # 17 on pages 56 and 57 of the *Pre-calculus 12* textbook.
- Also work on the **Chapter 1 Practice Test** exercises #1 to #15 on pages 58 and 59 of the *Pre-calculus 12* textbook.

ANSWER KEY

1.1 Horizontal and Vertical Translations
1.2 Stretches and Reflections
1.3 Combining Transformations

1. 

2. 

3. 

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

5. f must be vertically stretched about the x-axis by a factor of $\frac{3}{2}$,
then horizontally stretched about the y-axis by a factor of 4,
then reflected in the x-axis,
and then shifted 7 units to the right and one unit upward.
Mapping: $(x,y)\rightarrow\left(-4x+7,\frac{3}{2}y+1\right)$

6. Rewrite $y+5=-2.5g(9+2x)$ as $y=-2.5g(2(x+4.5))-5$.
g must be vertically stretched about the x-axis by a factor of 2.5,
then horizontally stretched about the y-axis by a factor of $\frac{1}{2}$,
then reflected in the y-axis,
and then shifted 4.5 units to the left and five units downward.
Mapping: $(x,y)\rightarrow\left(\frac{1}{2}x-4.5,-2.5y-5\right)$

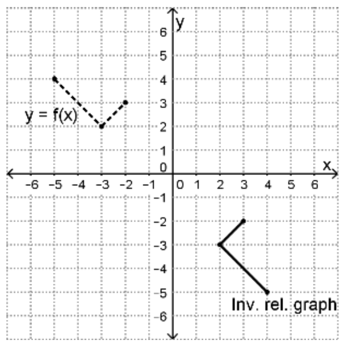
7. $(4,-5)$ will become $(-5,0)$.

8. Rewrite $y=-3f\left(-10+4x\right)-8$ as $y=-3f\left(4(x-2.5)\right)-8$.
$(8,3)$ will get mapped onto $(4.5,-17)$.

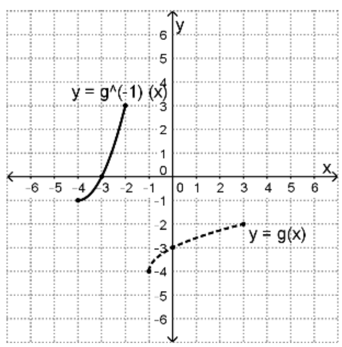
9. $2f(-2x+4)+1=2(5(-2x+4)-2)+1=-20x+37$

10. $-3g(6-x)-4=-3\left(2(6-x)^2-3(6-x)\right)-4=-6x^2+63x-162$

1.4 Inverse of a Relation

1. 

No, the inverse is not a function.

2. 

Domain of g = $\{x \mid -1 \le x \le 3, x \in \mathbb{R}\}$

Range of g = $\{y \mid -4 \le y \le -2, y \in \mathbb{R}\}$

Domain of g^{-1} = $\{x \mid -4 \le x \le -2, x \in \mathbb{R}\}$

Range of g^{-1} = $\{y \mid -1 \le y \le 3, y \in \mathbb{R}\}$

3.