

LESSON
1-3

Transformations of Function Graphs

Practice and Problem Solving: A/B

Let $g(x)$ be the transformation of $f(x)$. Write the rule for $g(x)$ using the change described.

1. reflection across the y -axis followed by a vertical shift 3 units up

$$g(x) = f(-x) + 3$$

2. horizontal stretch by a factor of 5 followed by a horizontal shift right 2 units

$$g(x) = f\left(\frac{1}{5}(x-2)\right)$$

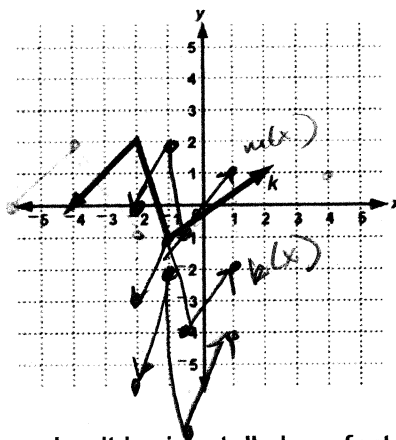
3. vertical compression by a factor of $\frac{1}{8}$ followed by a vertical shift down 6 units

$$g(x) = \frac{1}{8}f(x) - 6$$

4. reflection across the x -axis followed by a vertical stretch by a factor of 2, a horizontal shift 7 units left, and a vertical shift 5 units down

$$g(x) = -2f(x+7) - 5$$

Use the graph to perform each transformation.



-2	-4	0	-3	-6
-1	-2	2	-1	-2
-1/2	-1	-1	-4	-8
1	2	1	-2	-4

5. Transform $y = k(x)$ by compressing it horizontally by a factor of $\frac{1}{2}$.

mult x by $\frac{1}{2}$

Label the new function $m(x)$. Which coordinate is multiplied by $\frac{1}{2}$?

x

6. Transform $y = k(x)$ by translating it down 3 units. Label the new function $p(x)$. What happens to the y -coordinate in each new ordered pair?

subtract 3

7. Transform $y = k(x)$ by stretching it vertically by a factor of 2. Label the new function $q(x)$. Which coordinate is multiplied by 2?

y

8. Describe how the coordinates of a function change when the function is

translated 2 units to the left and 4 units up. subtract 2 from x add 4 to y

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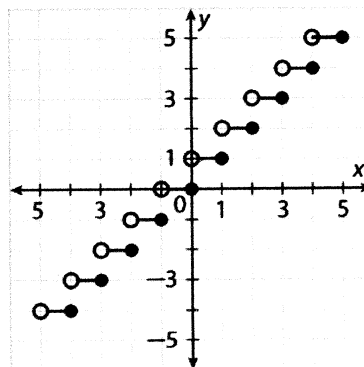
Transformations of Function Graphs

Practice and Problem Solving: C

Recall the graph of the ceiling function $f(x) = \lceil x \rceil$, shown.

The following situation describes a transformation of $f(x)$:

To rent a concert hall for one hour costs \$40 plus an initial cleaning fee of \$120. There is a charge of \$40 for every additional hour or fraction of an hour thereafter.



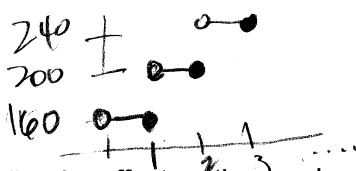
Use the description for Problems 1–6.

1. Write a transformation function $g(x)$ in terms of $f(x)$

describing the cost of renting the concert hall.

$$g(x) = 40f(x) + 120$$

2. Graph $g(x)$. Show the rental cost for up to 8 hours.



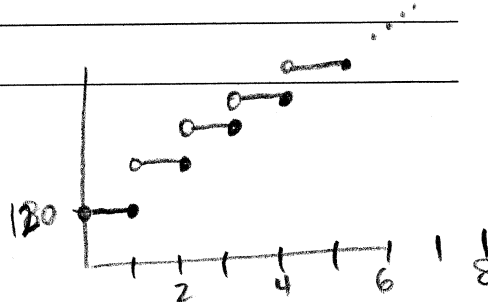
160
200

3. Describe the effect on the graph of $g(x)$ if the cleaning fee were changed to \$80. Then write a transformation function $h(x)$ in terms of $g(x)$ based on this situation.

$$h(x) = g(x) - 40$$

shifted down 40

4. Graph $h(x)$. Show the rental cost for up to 8 hours.



5. Describe the effect on the graph of $g(x)$ if the rental fees were changed to \$40 for every 2 hours. Then write a transformation function $j(x)$ in terms of $g(x)$ based on this situation.

horizontal stretch

$$g(x) = f\left[\frac{1}{2}(x)\right] + 120$$

6. Graph $j(x)$. Show the rental cost for up to 8 hours.

