

Transformation Investigation (LT 1.1)
Advanced Algebra

All graphs must be on graph paper. Use a straight edge, label your axes, plot critical points and give your scale if it is other than by ones. Neatness counts! The best way to learn from this investigation is to not rely on your graphing calculator.

For problems 1 – 3, the parent function is $f(x) = |x|$. The parent function needs to be graphed on the same graph for problems 1 and 2. Give all domains and ranges in interval notation.

1.

- a) Graph $g(x) = |x - 2|$.
- b) How is the graph of $g(x)$ related to the graph of $f(x)$?

- c) What is the domain of $g(x)$?

- d) What is the range of $g(x)$?

2.

- a) Graph $h(x) = |x + 2|$.
- b) How is the graph of $h(x)$ related to the graph of $f(x)$?

- c) What is the domain of $h(x)$?

- d) What is the range of $h(x)$?

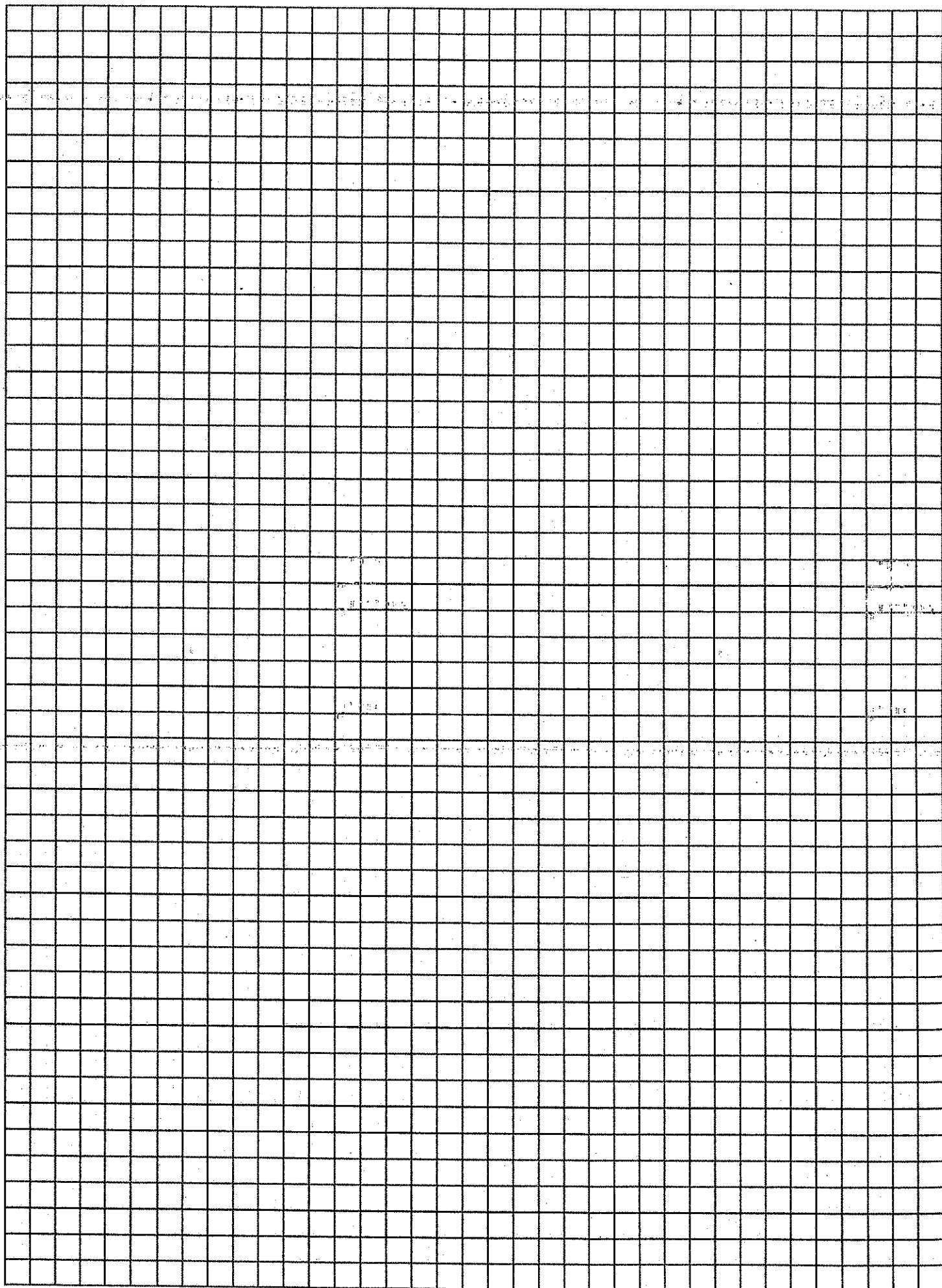
3. Problems 1 and 2 are absolute value functions of the form $f(x) = |x - h|$.

- a) What is the h -value for #1?

- b) What is the h -value for #2?

- c) Given a graph labeled $f(x)$. Describe the graph of $f(x - 1)$. Give your answer in terms of transformations.

- d) Given a graph labeled $f(x)$. Describe the graph of $f(x + 1)$. Give your answer in terms of transformations.



For problems 4 – 6, the parent function is $f(x) = x^2$. The parent function needs to be graphed for problems 4 and 5. Draw a new set of axes for each problem. Give all domains and ranges in interval notation.

4.

a) Graph $g(x) = x^2 - 3$.

b) How is the graph of $g(x)$ related to the graph of $f(x)$?

c) What is the domain of $g(x)$?

d) What is the range of $g(x)$?

5.

a) Graph $h(x) = x^2 + 4$.

b) How is the graph of $h(x)$ related to the graph of $f(x)$?

c) What is the domain of $h(x)$?

d) What is the range of $h(x)$?

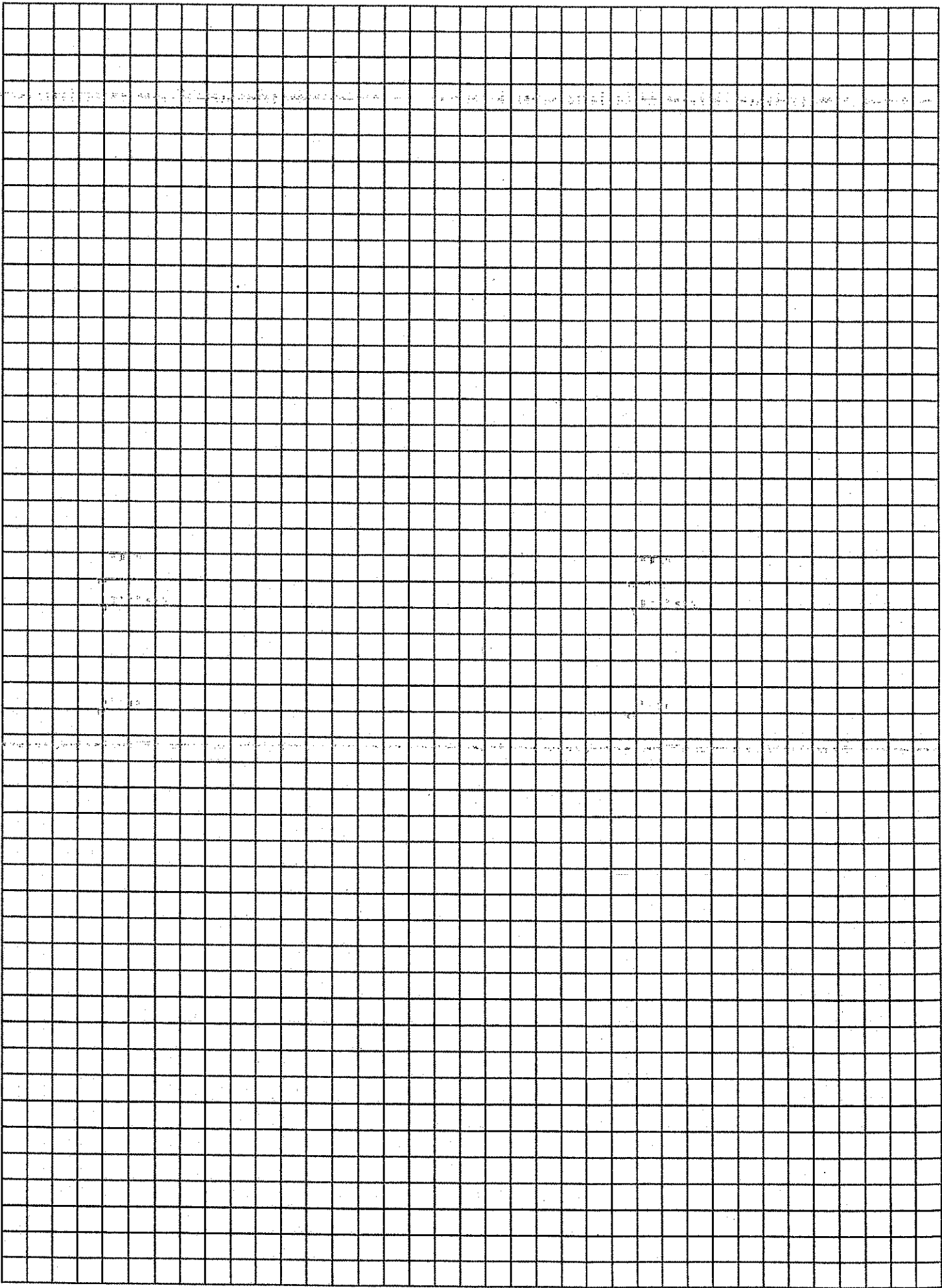
6. Problems 4 and 5 are quadratic functions of the form $f(x) = x^2 + k$.

a) What is the k -value for #4?

b) What is the k -value for #5?

c) Given a graph labeled $f(x)$. Describe the graph of $f(x) - 7$. Give your answer in terms of transformations.

d) Given a graph labeled $f(x)$. Describe the graph of $f(x) + 10$. Give your answer in terms of transformations.



For problems 7 – 9, the parent function is $f(x) = \sqrt{x}$. The parent function needs to be graphed for problems 7 and 8. Draw a new set of axes for each problem. Give all domains and ranges in interval notation.

7.

a) Graph $g(x) = \sqrt{x - 2} + 3$.

b) How is the graph of $g(x)$ related to the graph of $f(x)$?

c) What is the domain of $g(x)$?

d) What is the range of $g(x)$?

8.

a) Graph $h(x) = \sqrt{x + 4} - 4$

b) How is the graph of $h(x)$ related to the graph of $f(x)$?

c) What is the domain of $h(x)$?

d) What is the range of $h(x)$?

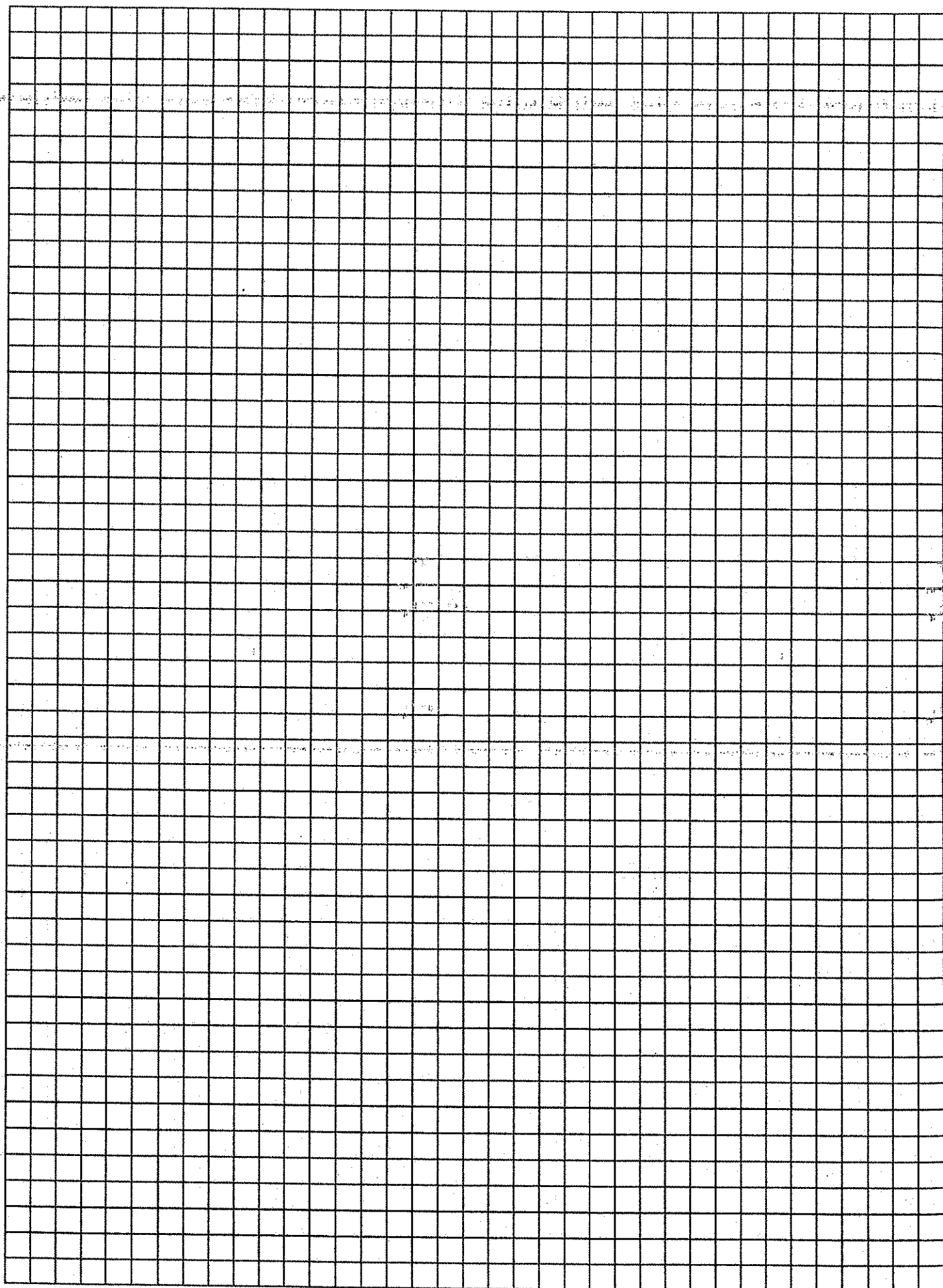
9. Problems 7 and 8 are square root functions of the form $f(x) = \sqrt{x - h} + k$

a) What is the h-value for #7? the k-value?

b) What is the h-value for #8? the k-value?

c) Given a graph labeled $f(x)$. Describe the graph of $f((x - 1) + 6)$. Give your answer in terms of transformations.

d) Given a graph labeled $f(x)$. Describe the graph of $f(x + 5) - 8$. Give your answer in terms of transformations.



For problems 10 – 12, the parent function is $f(x) = |x|$. The parent function needs to be graphed for problems 10 and 11. Draw a new set of axes for each problem. Give all domains and ranges in interval notation.

10.

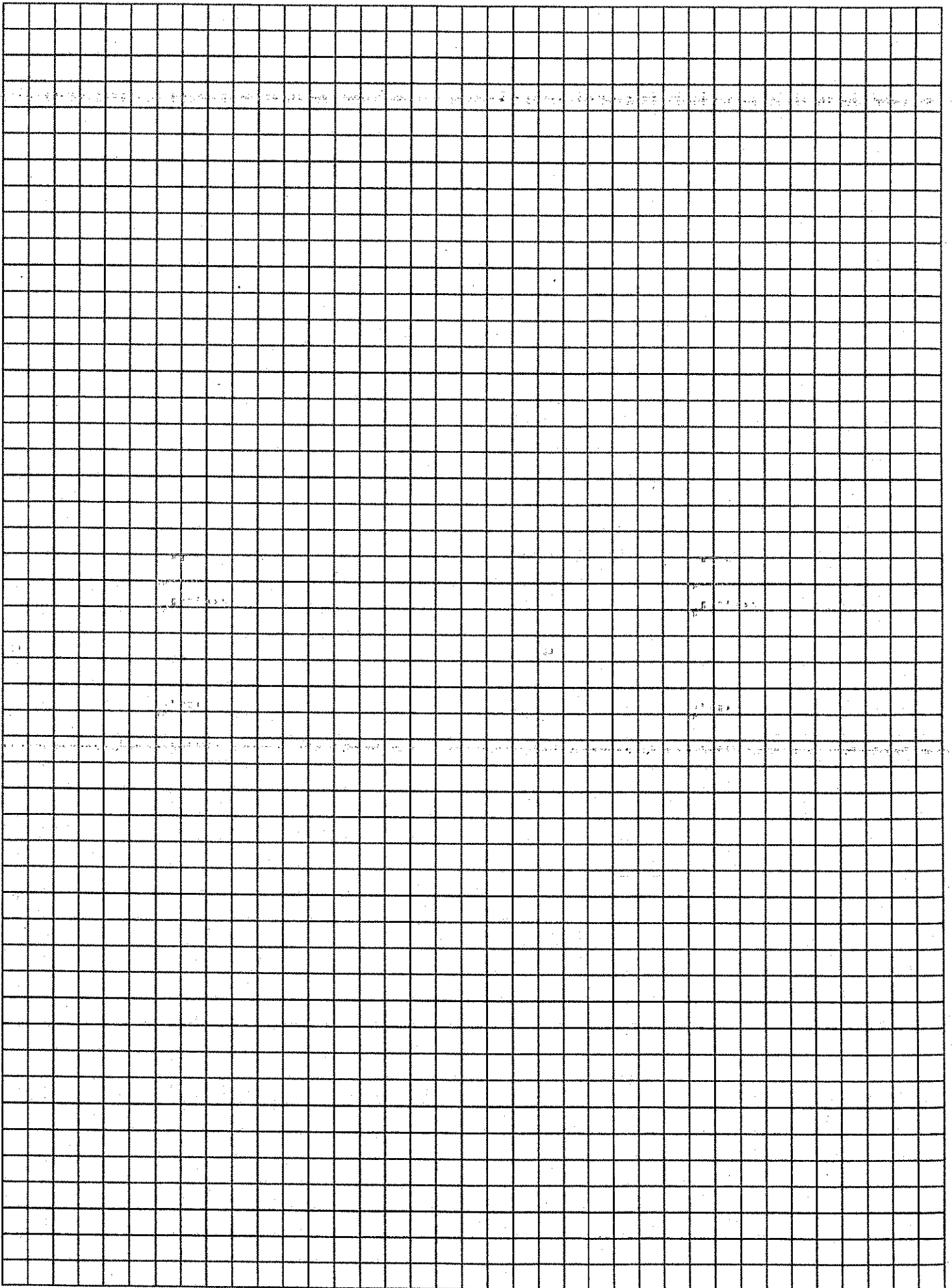
- a) Graph $g(x) = 3|x|$.
- b) How is the graph of $g(x)$ related to the graph of $f(x)$?
- c) What is the domain of $g(x)$?
- d) What is the range of $g(x)$?

11.

- a) Graph $h(x) = \frac{1}{2}|x|$
- b) How is the graph of $h(x)$ related to the graph of $f(x)$?
- c) What is the domain of $h(x)$?
- d) What is the range of $h(x)$?

12. Problems 10 and 11 are absolute value functions of the form $f(x) = a|x|$

- a) What is the a -value for #10?
- b) What is the a -value for #11?
- c) Given a graph labeled $f(x)$. Describe the graph of $6f(x)$. Give your answer in terms of transformations.
- d) Given a graph labeled $f(x)$. Describe the graph of $\frac{2}{3}f(x)$. Give your answer in terms of transformations.



For problems 13 – 15, the parent function is $f(x) = \sqrt{x}$. The parent function needs to be graphed for problems 13 and 14. Draw a new set of axes for each problem. Give all domains and ranges in interval notation.

13.

a) Graph $g(x) = -\sqrt{x}$

b) How is the graph of $g(x)$ related to the graph of $f(x)$?

c) What is the domain of $g(x)$?

d) What is the range of $g(x)$?

14.

a) Graph $h(x) = \sqrt{-x}$

b) How is the graph of $h(x)$ related to the graph of $f(x)$?

c) What is the domain of $h(x)$?

d) What is the range of $h(x)$?

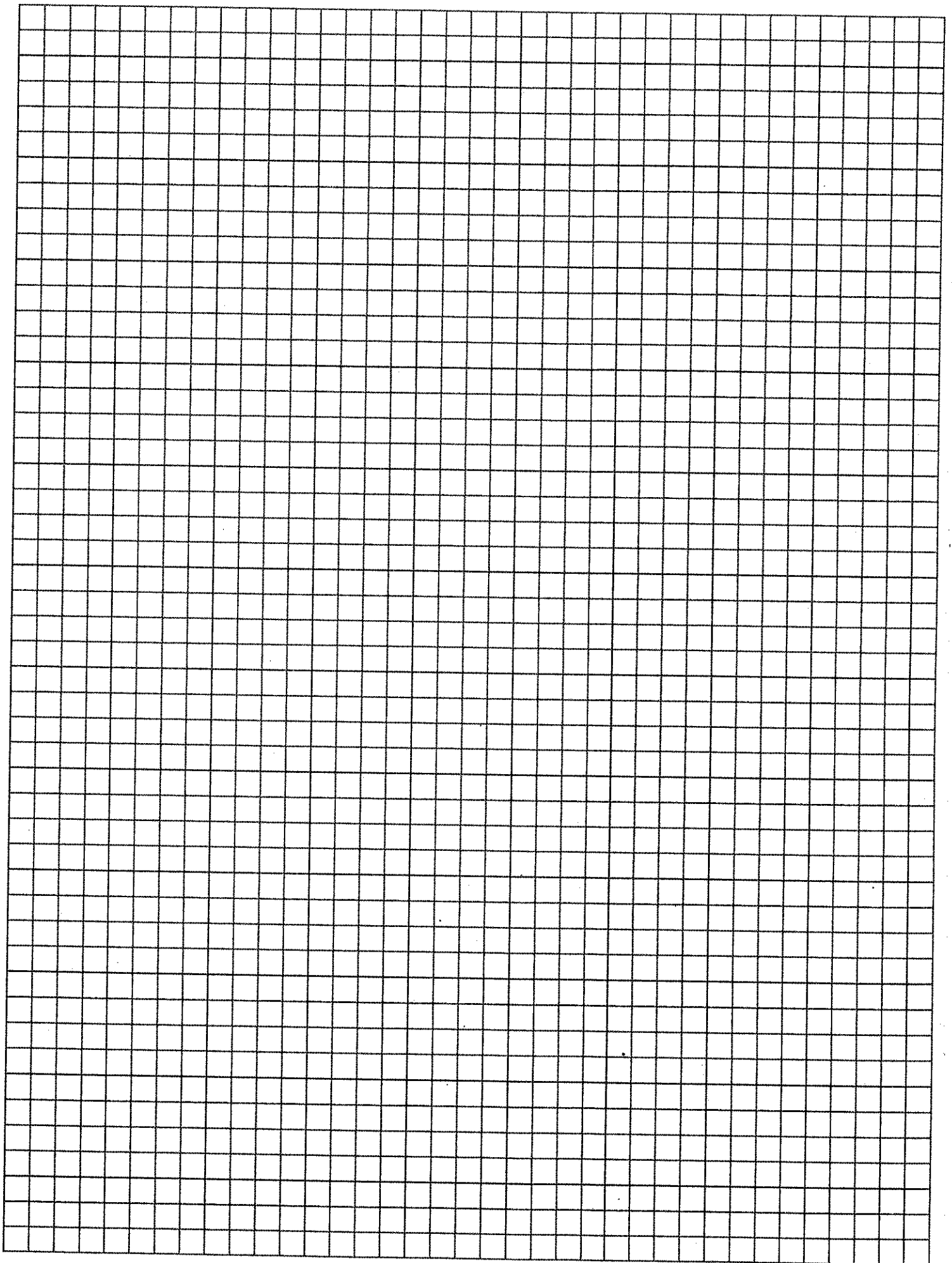
15. Problems 13 and 14 are square root functions of the form $f(x) = -\sqrt{x}$ or $f(x) = \sqrt{-x}$

a) What is the k-value for #4?

b) What is the k-value for #5?

c) Given a graph labeled $f(x)$. Describe the graph of $-f(x)$. Give your answer in terms of transformations.

d) Given a graph labeled $f(x)$. Describe the graph of $f(-x)$. Give your answer in terms of transformations.



17. Some of the points on a function, $g(x)$ include: $(-3, 1)$, $(-2, 2)$, $(-1, 4)$, $(1, -1)$, and $(3, 2)$. Plot these points on a piece of graph paper, and connect them from left to right.

Graph each of the following functions, using $g(x)$ as a reference. Each should be on a separate graph.

a) $g(x - 4)$

b) $g(x + 3)$

c) $g(x) + 3$

d) $g(x) - 4$

e) $g(-x)$

f) $-g(x)$

g) $2g(x)$

18. Tell how the graph in part (a) should be translated and/or reflected to obtain the remaining graphs. The first one is completed for you.

(a) $f(x) = x^3$

(b) $f(x) = (x + 3)^3$

(c) $f(x) = -(x + 3)^3$

(d) $f(x) = (-x)^3 + 5$

