Graphing Functions and Transformations

PERT Math •Section 4.4

Name: _____	Date: _____	Score: _____ / 12

Quick Review and Helpful Hints

A function pairs each input with exactly one output. Pay attention to what the input means, what rule is being applied, and whether the question asks for a value, a rule, a domain, or an interpretation.

▷ **Example:** For $f(x) = 2x + 5$, find $f(4)$.
Work: Replace x with 4: $f(4) = 2(4) + 5 = 13$.

★ **Answer:** 13

Practice Problems

Solve each problem. Show enough work that another student could follow your thinking.

1. Describe $g(x) = f(x) + 5$ compared to f.

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2. Describe $g(x) = f(x) - 3$ compared to f.

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3. Describe $g(x) = f(x + 2)$ compared to f.

_____

4. Describe $g(x) = f(x - 6)$ compared to f.

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5. Describe $g(x) = -f(x)$ compared to f.

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6. Describe $g(x) = f(-x)$ compared to f.

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7. Describe $g(x) = 3f(x)$ compared to f.

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8. Describe $g(x) = \frac{1}{2}f(x)$ compared to f.

_____

9. If $f(x) = x^2$, write the rule for shifting it right 4 and up 1.

_____

10. If $f(x) = |x|$ has vertex $(0, 0)$, find the vertex of $g(x) = |x + 3| - 2$.

_____

Word Problems

11. A graph of f is shifted up 7 to make g. Write g in terms of f.

_____

12. A parent graph f is reflected over the x-axis and shifted left 5. Write the new rule.

_____

Answer Keys

1. Shift up 5
2. Shift down 3
3. Shift left 2
4. Shift right 6
5. Reflect over the x-axis
6. Reflect over the y-axis
7. Vertical stretch by 3
8. Vertical compression by $\frac{1}{2}$
9. $g(x) = (x-4)^2 + 1$
10. $(-3, -2)$
11. $g(x) = f(x) + 7$
12. $g(x) = -f(x+5)$

Step-by-Step Explanations

1. Adding 5 outside the function lifts every output, so the whole graph slides up by 5 units.

2. Subtracting outside takes away from every output, dragging the graph 3 units downward.

3. Changes inside the parentheses act in reverse: $+2$ moves the graph to the left, not the right.

4. Subtracting 6 inside makes the graph wait 6 extra units before doing what f would do — that's a right shift.

5. A negative on the whole output flips every y-value upside down, mirroring the graph across the x-axis.

6. Negating the input swaps left and right, so the graph reflects across the y-axis instead.

7. Multiplying the output by 3 pulls every point three times farther from the x-axis — a vertical stretch.

8. A factor between 0 and 1 outside squishes the graph toward the x-axis, so it's a vertical compression.

9. Right shifts subtract inside, up shifts add outside — apply both to the parent x^2.

10. $x + 3$ inside moves the vertex 3 left, and -2 outside drops it 2 down.

11. An upward shift is an outside change, so the whole rule becomes $f(x) + 7$.

12. The reflection puts a negative outside, and the left shift swaps x for $x + 5$ inside — combine them.

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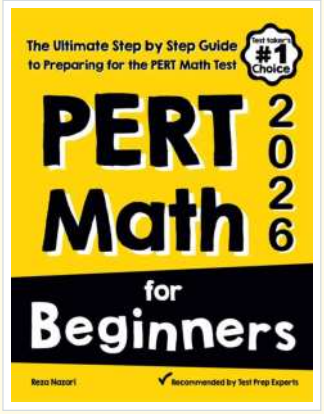

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