

(*inside*
= *horizontal*
= *LIES*) *outside*
= *vertical*
= *TRUTH*

add or subtract = translation (or shift or slide)
multiplication by a negative = reflection
multiplication by a number = stretch or shrink

Describe the transformations of $f(x)$ for the following functions.

1. $f(x) = x^2$ to $g(x) = x^2 - 7$

vertical shift down 7

2. $f(x) = x^2$ to $g(x) = (x + 4)^2$

horizontal shift 4 units left

3. $f(x) = x^3$ to $g(x) = -x^3$

reflect about the x-axis

4. $f(x) = x^5$ to $g(x) = (-x + 2)^5$

reflect about the y-axis and left 2 units

5. $f(x) = \sqrt{x}$ to $g(x) = 2\sqrt{x-1}$

vertical stretch by a factor of 2 and 1 unit right

6. $f(x) = |x|$ to $g(x) = -\frac{1}{4}|x|$

reflect about the x-axis and vertical shrink by a factor of $\frac{1}{4}$

7. $f(x) = x^2$ to $g(x) = (-3x - 2)^2 + \frac{2}{5}$

reflect @ y-axis, horiz. shrink by a factor of 3, right 2, up $\frac{2}{5}$ or 0.4

8. $f(x) = \sqrt[3]{x}$ to $g(x) = \sqrt[3]{\frac{1}{5}x} + 20$

horiz stretch by 5 and up 20

9. $f(x) = x$ to $g(x) = -6x + 3$

reflect over x-axis, vertical stretch by 6 up 3 units

10. $f(x) = x^{45}$ to $g(x) = -(6x + 90)^{45} - 1000$

reflect over x-axis
horiz. shrink by factor of 6
left 90 units, down 1000

Write the function $g(x)$ that is created by transforming $f(x)$, given the description.

11. $f(x) = x^2$; shifted 3 units right and shifted 4 units up.

$$g(x) = (x-3)^2 + 4$$

12. $f(x) = |x|$; reflected vertically and shrunk horizontally by a factor of 2.

$$g(x) = -|2x|$$

13. $f(x) = \sqrt{x}$; shrunk vertically by a factor of 3, reflected horizontally and shifted 9 units left.

$$g(x) = \frac{1}{3}\sqrt{-x+9}$$

14. $f(x) = x^3$; shifted 1.2 units down, reflected vertically, reflected horizontally and stretched vertically by a factor of 7.

$$g(x) = -7(x)^3 - 1.2$$

15. $f(x) = \sqrt[3]{x}$; stretched vertically by a factor of 2, stretched horizontally by a factor of 2, shifted left 2 units and shifted 2 units down.

$$g(x) = 2\sqrt[3]{\frac{x}{2}+2} - 2$$

