

Transformations

1. Up c units $f(x) + c$

2. Down c units $f(x) - c$

3. Right c units $f(x - c)$

4. Left c units $f(x + c)$

5. Reflect across x axis $-f(x)$

6. Reflect across y axis $f(-x)$

$$f(x) = x^2$$
$$f(x) + 4 = x^2 + 4$$

7. Vertical Stretch $cf(x)$, $c > 1$

8. Vertical Shrink $c f(x)$, $0 < c < 1$

9. Horizontal Stretch $f(cx)$, $0 < c < 1$

10. Horizontal Shrink $f(cx)$, $c > 1$

$$f(x) = 5 + (x-3)^2$$

$$\textcircled{x^2} = (x-3)^2 + 5$$

$$f(x) = -7 - (x+7)^3$$

$$\textcircled{x^3} = \overset{\uparrow}{-} \underline{(x+7)}^3 \underline{-7}$$

Identify Transformations

Up 5 units

Right 3 units

Move left 7

Ref across x.

Down 7

Use x^2

Up 5

Ref across y

$$f(x) = (-x)^2 + 5$$

Use \sqrt{x}

Down 3

Left 6

$$f(x) = \sqrt{x+6} - 3$$

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51-62 Id Trans

51. $12 - x^2 = -x^2 + 12$

$$\begin{array}{cc} -x^2 & (-x)^2 \\ -2^2 & (-2)^2 \\ -4 & 4 \end{array}$$

up 12,
Ref acr
x.

$$f(x) = x^2$$

$$-f(x) = -x^2$$

Ref acr : $(-x)^2 + 12$
7

52. $(x - 8)^2$

RIGHT 8

$$x^2 - 8$$

53. $-(x + 5)^2 + 2$

up 2, Left 5, ref acr. x.

54. $-(x + 10)^2 + 5$

Left 10, up 5, ref acr. x.

55. $2(x - 4)^2 + 3$

Right 4, up 3, vert stretch

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

$$c f(x), c = 2$$

$$\frac{1}{3}(x-4)^2 + 3$$

$$c f(x), c = \frac{1}{3} \rightarrow \text{v. shrink.}$$

$$\left[\overset{c}{2} (\overset{x}{x-4}) \right]^2 + 3$$

$$f(x) = x^2$$

$$f(2x) = [2(x)]^2$$

- Horiz shrink

$$56. \quad \ominus \frac{1}{4} (x+2)^2 - 2$$

$$- f(x)$$

Down 2, Left 2, v. shrink
Ref over x.

$$57. \quad x^3 + 7$$

up 7

$$58. \quad -x^3 - 1$$

Down 1, ref over x.

$$(-x)^3 - 1$$

Ref over y.

$$59. \quad (x-1)^3 + 2$$

Up 2, Right 1

$$60. \quad - (x+3)^3 - 10$$

Down 10, Left 3, ref over x

$$61. \quad 3(x-2)^3$$

Right 2, v. stretch

✓ 1. Vert shrink ($\frac{1}{3}$)

✓ 2. Ref across y

✓ 3. Up 5

✓ 4. Left 1

✓ 5. Hor. stretch ($\frac{1}{2}$)

$$f(x) = x^2$$

$$f(x) = \frac{1}{3} \left[-\frac{1}{2}(x+1) \right]^2 + 5$$

✓ 1. Down 4

✓ 2. Ref across x.

✓ 3. Left 2

$$f(x) = |x|$$

$$f(x) = - \left[(x+2) \right] - 4$$

$$f(x) = -(x+2) - 4$$

1. $f(x) = x^3$

up 2

RIGHT 6

Ref across

x and y

Hor shrink (3)

2. $f(x) = \sqrt[5]{x}$

Down 4

Left 2

Ref across x

Hor stretch ($\frac{1}{2}$)

Vert shrink ($\frac{1}{3}$)

3. $f(x) = |x|$

RIGHT 10

Ref across y

Hor shrink (5)

Vert stretch (9)