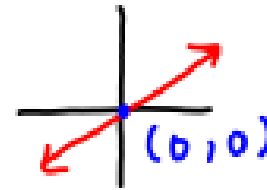# Transformations of a Function

5 Common Parent Functions:
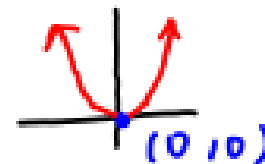
1) Linear: $f(x) = x$
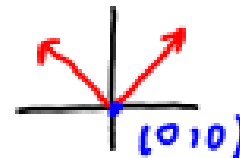
2) Quadratic: $f(x) = x^2$

3) Absolute Value: $f(x) = |x|$

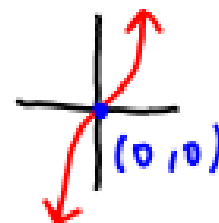4) Square Root: $f(x) = \sqrt{x}$

5) Cubic: $f(x) = x^3$

Horizontal Shift   **Transformations**   Vertical Shift
Left or Right $y = f(x+h) + k$ Up or Down

Inside the ( ), | |, or $\sqrt{}$ # Outside the ( ), $\sqrt{}$,

+#: Left ⎤ Think   or | |
−#: Right ⎦ Opposite   Think ⎰ +#: Up   Same ⎱ −#: Down

1) $y = (x+2)^2 + 4$ 3) $y = \sqrt{x+2} - 1$ 5) $y = x - 2$

Left 2 ; Up 4   Left 2 ; Down 1   Down 2

                                                          6) $y = x^2 - 2$

                                                          Down 2

2) $y = |x-3| + 2$ 4) $y = (x-4)^3 - 2$

Right 3 ; Up 2   Right 4 ; Down 2   7) $y = (x+6)^3$

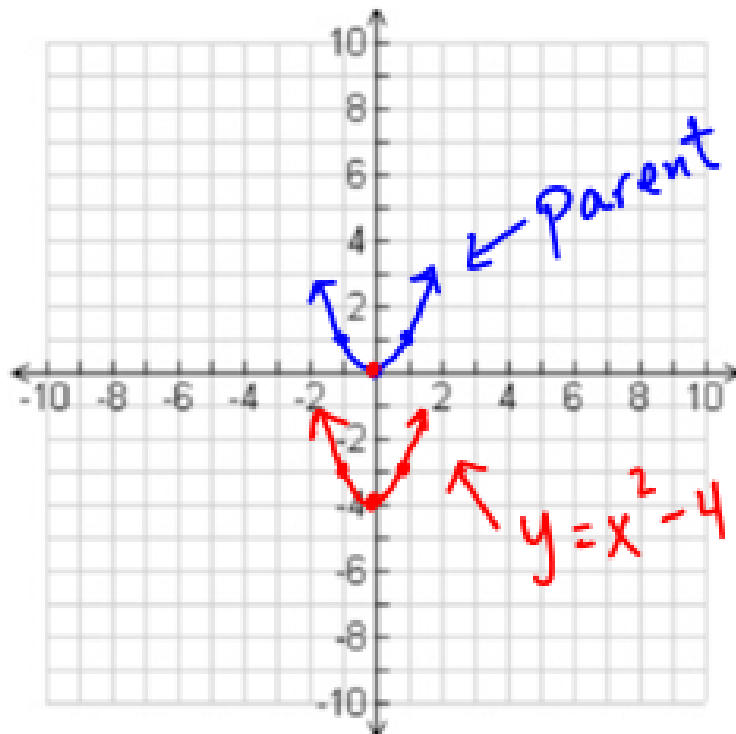   Left 6

State the equation of the parent function and describe the transformation. Then sketch the graphs.

8) $y = x^2 - 4$

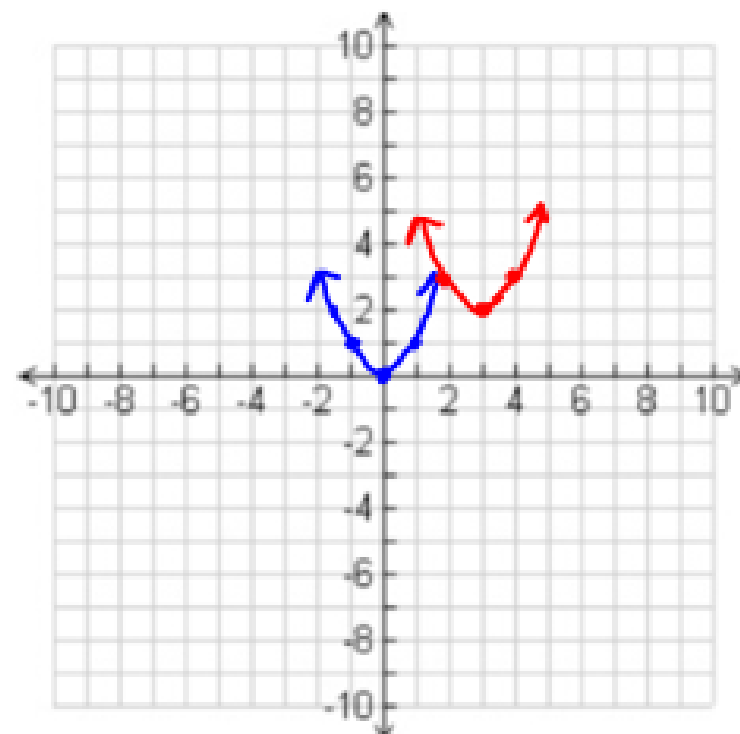Parent: $f(x) = x^2$

Transformations:

Down 4

9) $y = (x-3)^2 + 2$
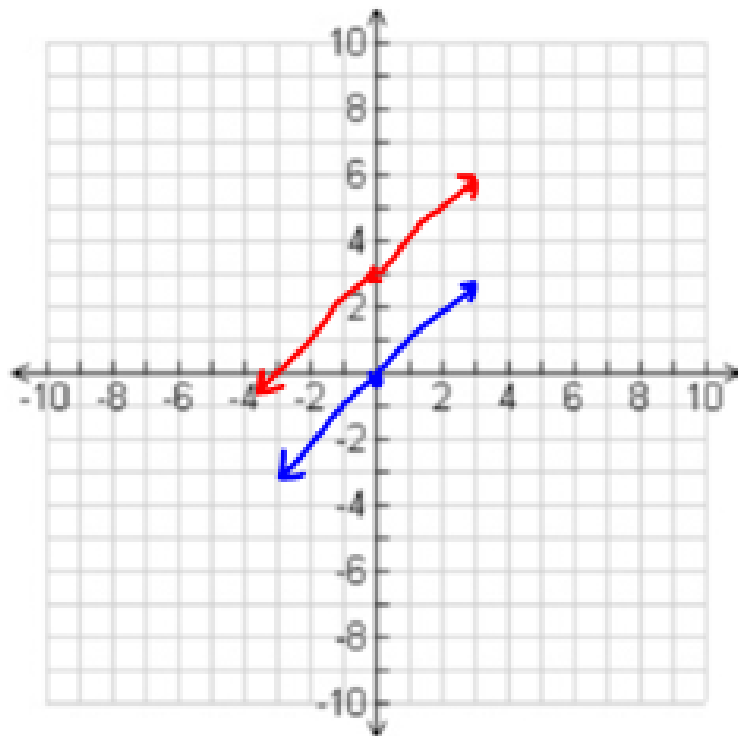
Parent: $f(x) = x^2$

Transformations:

Right 3, up 2

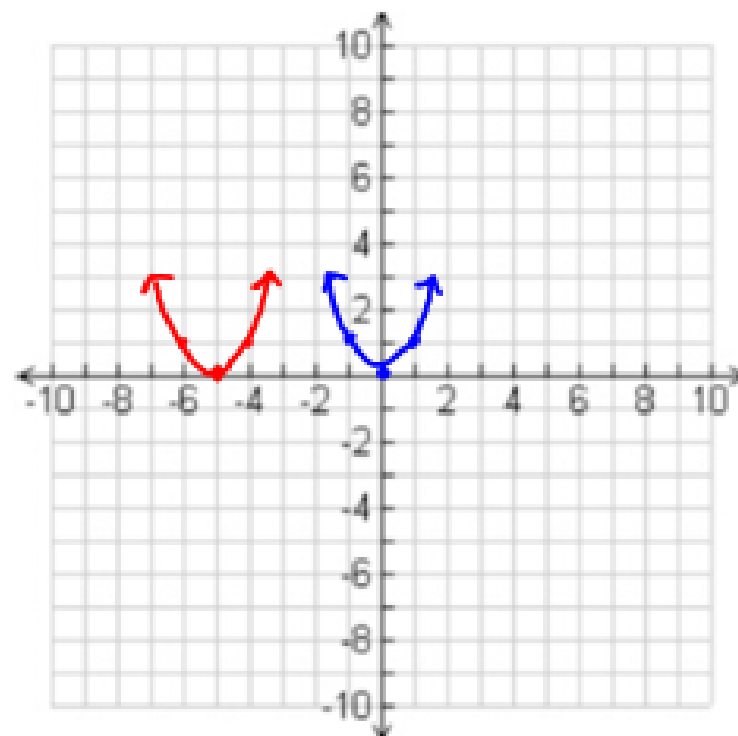10) $y = x + 3$

Parent: $f(x) = x$

Transformations:

up 3

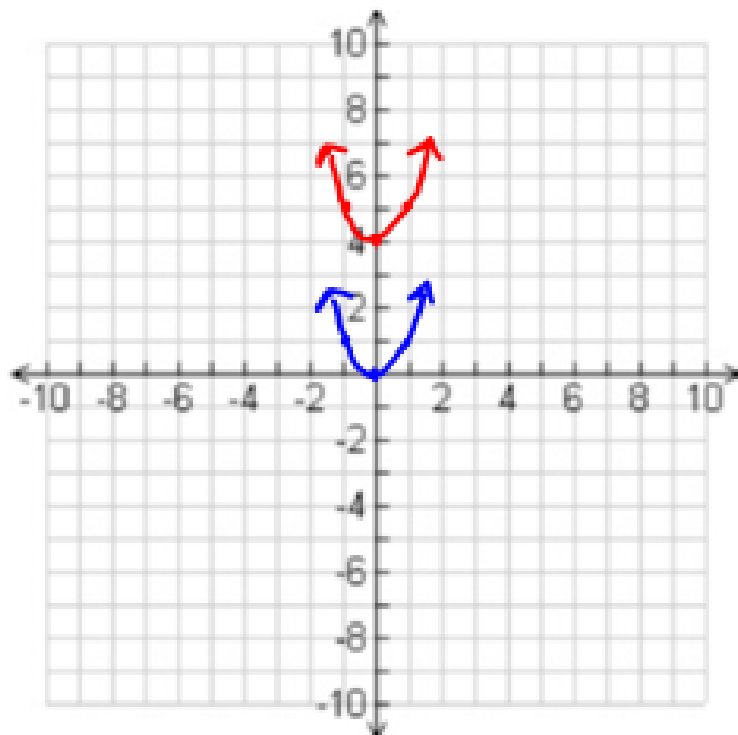11) $y = (x+5)^2$

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

Transformations:

Left 5

Try) $y = x^2 + 4$
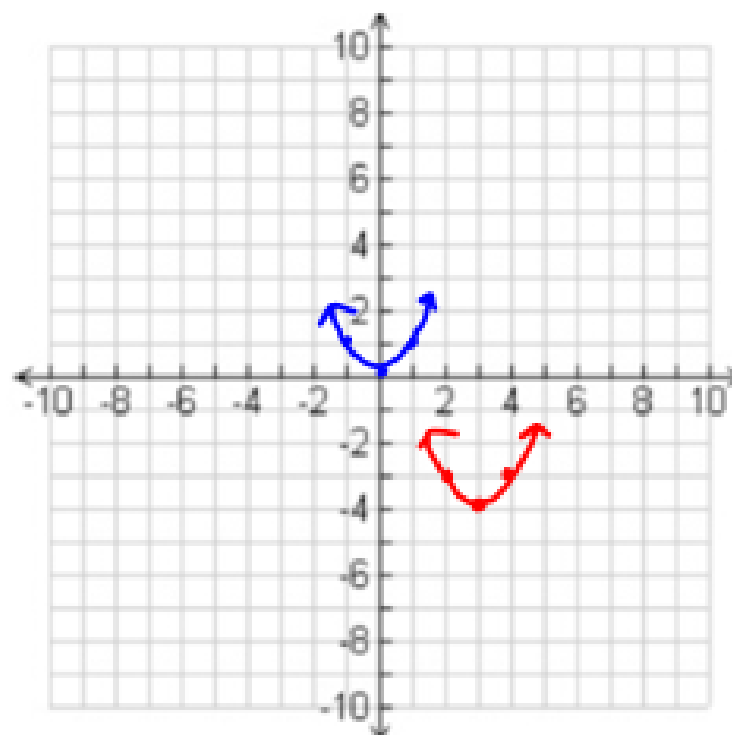
Parent: $f(x) = x^2$

Transformations:

Up 4

Try) $y = (x-3)^2 - 4$

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

Transformations:

Right 3, Down 4

Write the equation of the transformed function, f(x).

12) Absolute value: horizontal shift left 3, vertical shift up 5

$f(x) = |x+3| + 5$ +3 (Inside)   +5 (Outside)

13) Quadratic: vertical shift down 4, horizontal shift right 2

$f(x) = (x-2)^2 - 4$ −4 (Outside)   −2 (Inside)

14) Square Root: horizontal shift right 3, vertical shift down 2

$f(x) = \sqrt{x-3} - 2$ −3 (Inside)   −2 Outside

15) Quadratic: Vertex at (3, −2)   Right 3   Down 2

$f(x) = (x-3)^2 - 2$
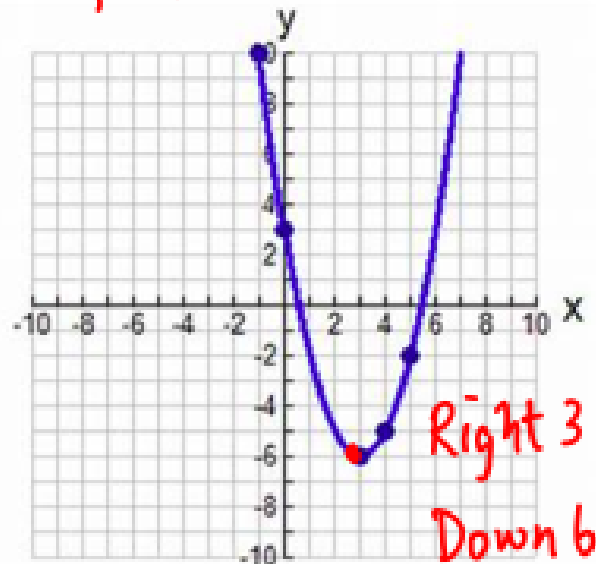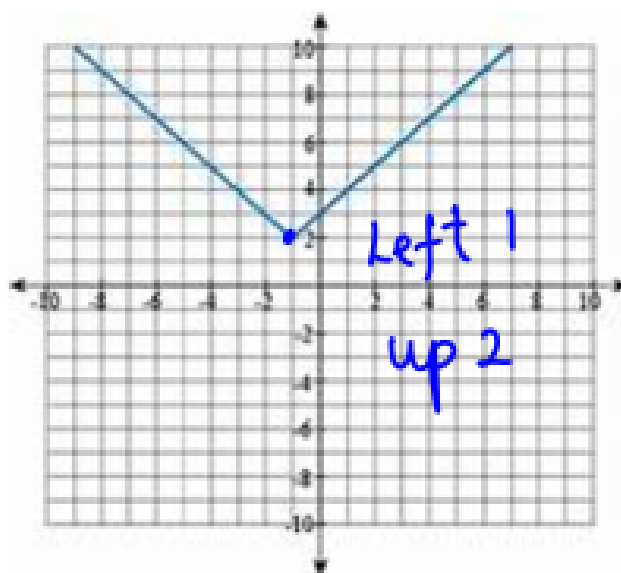
16) Linear: vertical shift down 3: $f(x) = x - 3$

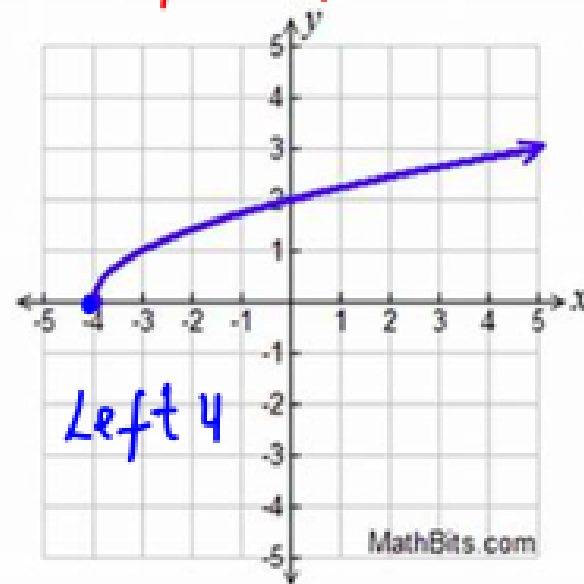# Write the equation for the following translations of their parent graphs.

17) $f(x) = (x-3)^2 - 6$

Right 3
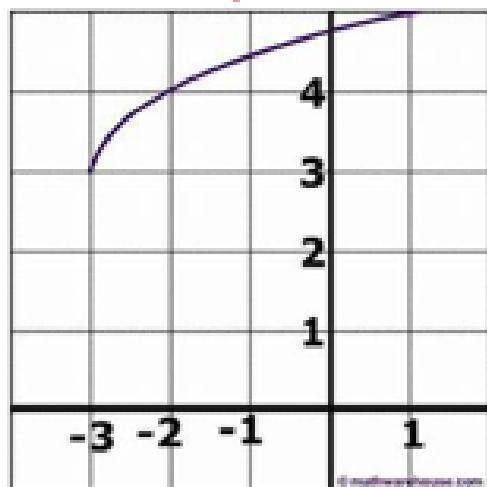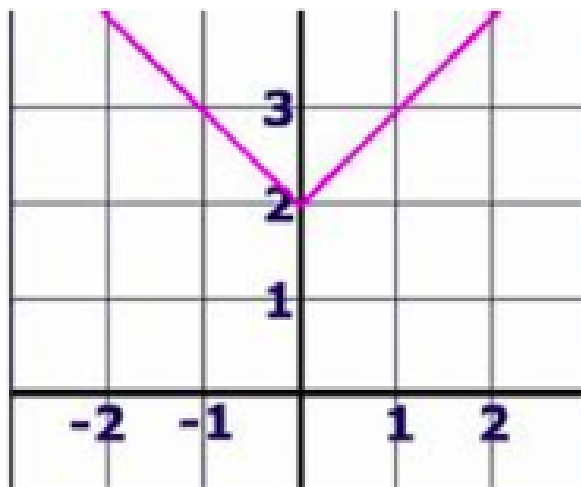Down 6

18) $f(x) = |x+1| + 2$

Left 1
up 2

19) $f(x) = \sqrt{x+4}$
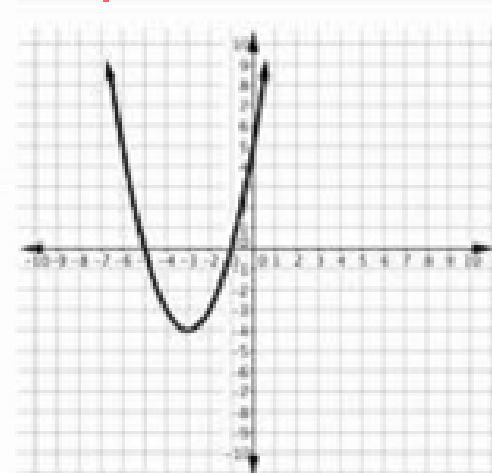
Left 4

MathBits.com

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

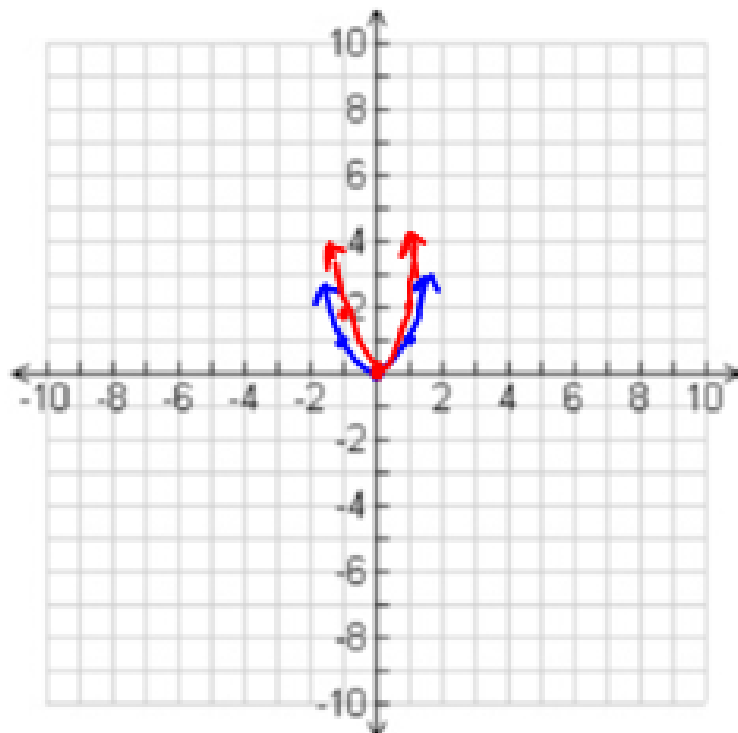21) $f(x) = |x| + 2$

22) $f(x) = (x+3)^2 - 4$

Vertical Stretch or Shrink

$$y = \textcircled{a} f(x+h) + k$$

↑

$|a| > 1$

stretch

multiply to the equation $0 < |a| < 1$

Shrink

23) $y = \textcircled{2} x^2$

24) $y = \textcircled{\dfrac{1}{2}}(x-3)^2$