

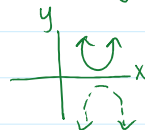
A.4 Notes: Parent Functions

All functions can have the following transformations:

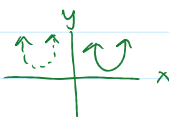
Vertical Translation/shift ($\pm k$): Moves up ($+k$) or down ($-k$)

Horizontal Translation/shift ($\pm h$): Moves left ($+h$) or right ($-h$)

Reflection over x-axis ($-a$): flips over x-axis



Reflection over y-axis ($-b$): flips over y-axis



Vertical Stretch or Compression (a):
 $|a| > 1 \rightarrow$ stretch (skinny)
 $0 < |a| < 1 \rightarrow$ compression (wider)

Horizontal Stretch or Compression (b):
 $|b| > 1 \rightarrow$ compression by factor of $1/b$
 $0 < |b| < 1 \rightarrow$ stretch by factor of $1/b$

* If there is a value for b , it must be factored to the front

$$y = (2x-4)^2 + 1$$

$$= a(x-2)^2 + 1$$

Library of Functions:

① Linear

Parent Function: $y = x$

$$y = mx + b$$

\uparrow \uparrow
 Slope y_{int}

D: $(-\infty, \infty)$

R: $(-\infty, \infty)$

② Quadratic

Parent Func: $y = x^2$
 $y = a(bx-h)^2 + k$

D: $(-\infty, \infty)$

R: if $a^+ \rightarrow [k, \infty)$

$a^- \rightarrow (-\infty, k]$

③ Cubic

Parent Func: $y = x^3$

$$y = a(bx-h)^3 + k$$

D: $(-\infty, \infty)$

④ Square Root

Parent Func: $y = \sqrt{x}$

$$y = a\sqrt{bx-h} + k$$

D: if $b^+ \rightarrow [h, \infty)$

$b^- \rightarrow (-\infty, h]$

$$D: (-\infty, \infty)$$

$$R: (-\infty, \infty)$$

$$D: \text{If } b^+ \rightarrow [h, \infty)$$

$$b^- \rightarrow (-\infty, h]$$

$$R: \text{If } a^+ \rightarrow [k, \infty)$$

$$a^- \rightarrow (-\infty, k]$$

⑤ Absolute Value

Parent Func: $y = |x|$
 $y = a|bx - h| + k$

$$D: (-\infty, \infty)$$

$$R: \text{If } a^+ \rightarrow [k, \infty)$$

$$a^- \rightarrow (-\infty, k]$$

⑥ Rational

Parent Func: $y = \frac{1}{x}$
 $y = \frac{a}{bx - h} + k$

$$D: (-\infty, h) \cup (h, \infty)$$

$$R: (-\infty, k) \cup (k, \infty)$$