Parent Functions

1) Linear: $y = mx + b$

2) Absolute Value: $y = |x|$

3) Polynomial: $y = x^2$ or $y = x^3$

4) Radical: $y = \sqrt{x}$ or $y = \sqrt[3]{x}$

5) Rational: $y = \frac{1}{x}$ or $y = \frac{1}{x^2}$

6) Exponential: $y = 2^x$

7) Logarithmic: $y = log\ x$

8) Greatest Integer: $y = int\ (x)$

9) Sine/Cosine: $y = sin\ x$ or $y = cos\ x$

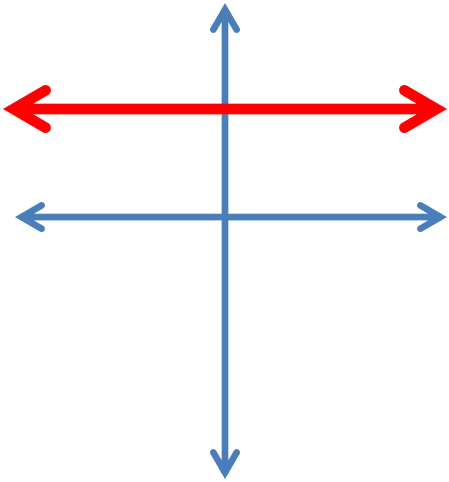
Attributes of Functions

Transformations

Linear: $y = mx + b$

Constant Function

f(x) = c

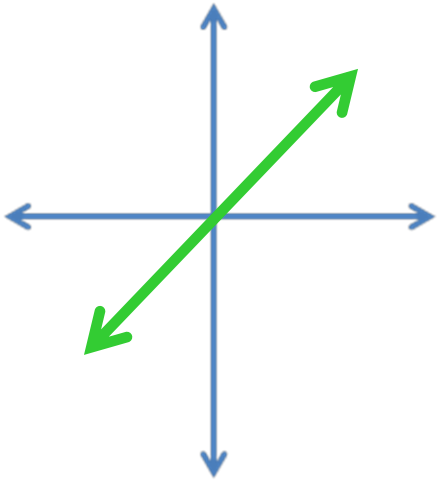


D: $(-\infty, \infty)$

R: $\{c\}$

Identity Function

f(x) = x

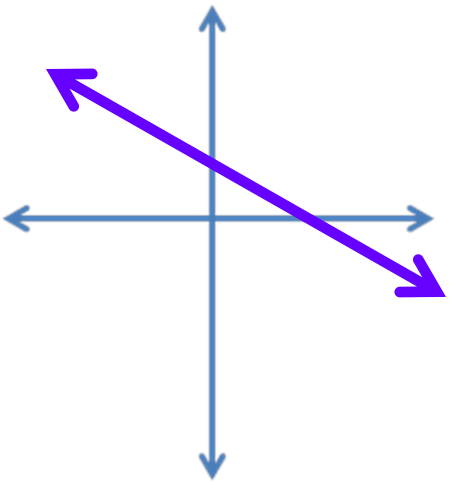


D: $(-\infty, \infty)$

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

Linear Function

f(x) = mx + b

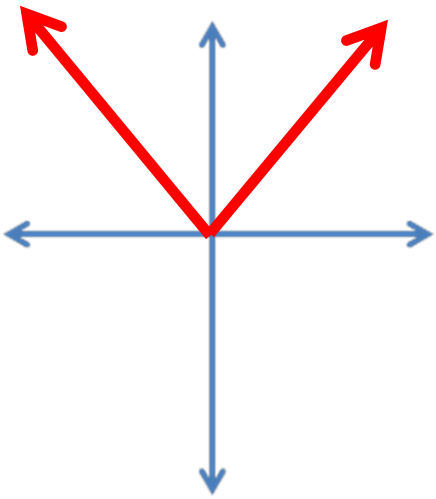


D: $(-\infty, \infty)$

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

Absolute Value: $y = |x|$

$$y = a|x - h| + k$$



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

R: $[0, \infty)$

Vertex: (h, k)

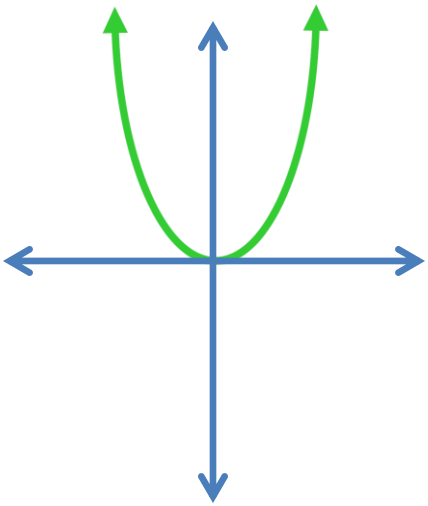
Polynomial: $y = x^2$ or $y = x^3$

$$y = a(x - h)^n + k$$

$f(x) = x^n$

Where "n" is positive and even

EX: $y = x^2$



D: (-∞, ∞)

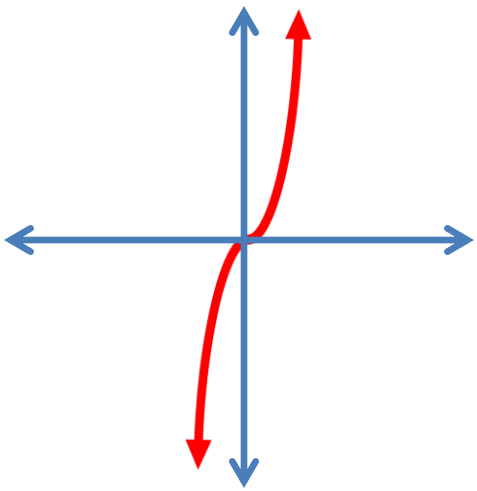
R: [0, ∞)

Even function b/c symmetric about y-axis

$f(x) = x^n$

Where "n" is positive and odd

EX: $y = x^3$



D: (-∞, ∞)

R: (-∞, ∞)

Odd function b/c symmetric about origin

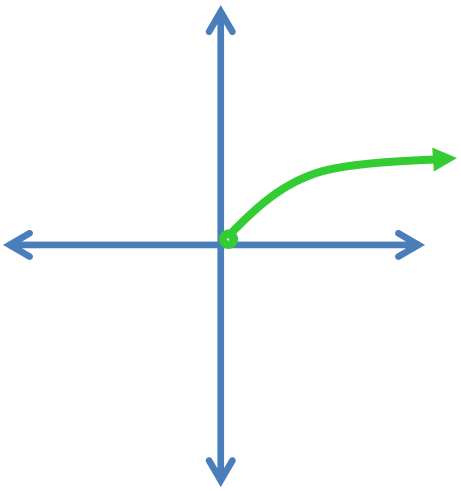
Radical: $y = \sqrt{x}$ or $y = \sqrt[3]{x}$

$$y = a\sqrt[n]{x - h} + k$$

$f(x) = x^n$

Where "n" is positive and even

EX: $y = \sqrt{x}$



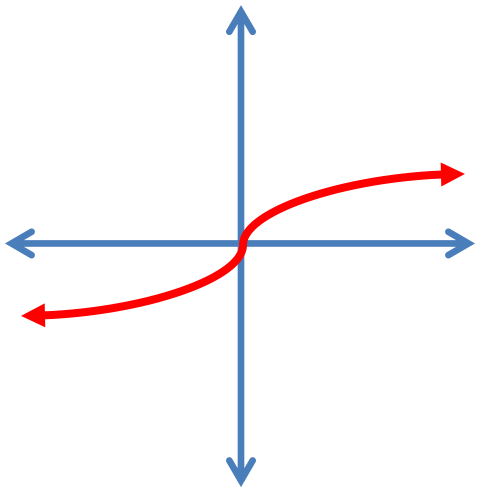
D: $[0, \infty)$

R: $[0, \infty)$

$f(x) = x^n$

Where "n" is positive and odd

EX: $y = \sqrt[3]{x}$



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

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

Odd function b/c symmetric about origin

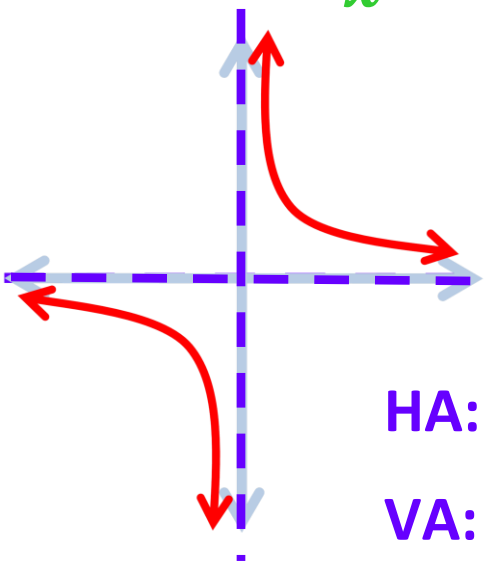
Rational: $y = \frac{1}{x}$ or $y = \frac{1}{x^2}$

$$y = \frac{a}{x - h} + k$$

$$f(x) = \frac{1}{x^n}$$

Where "n" is positive and odd

EX: $y = \frac{1}{x}$



HA: y = 0

VA: x = 0

D: $(-\infty, 0) \cup (0, \infty)$

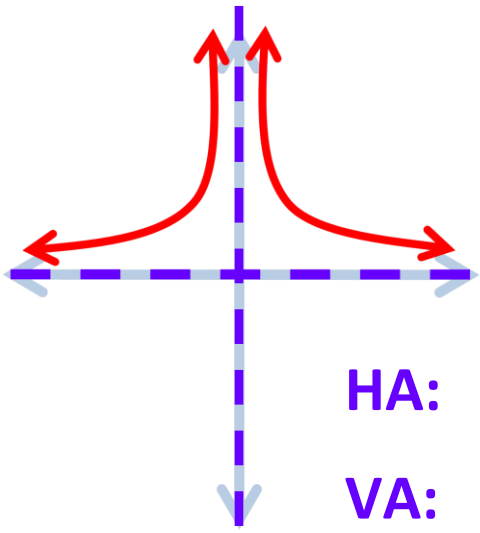
R: $(-\infty, 0) \cup (0, \infty)$

Odd function b/c symmetric about origin

$$f(x) = \frac{1}{x^n}$$

Where "n" is positive and even

EX: $y = \frac{1}{x^2}$



HA: y = 0

VA: x = 0

D: $(-\infty, 0) \cup (0, \infty)$

R: $(0, \infty)$

Even function b/c symmetric about y-axis

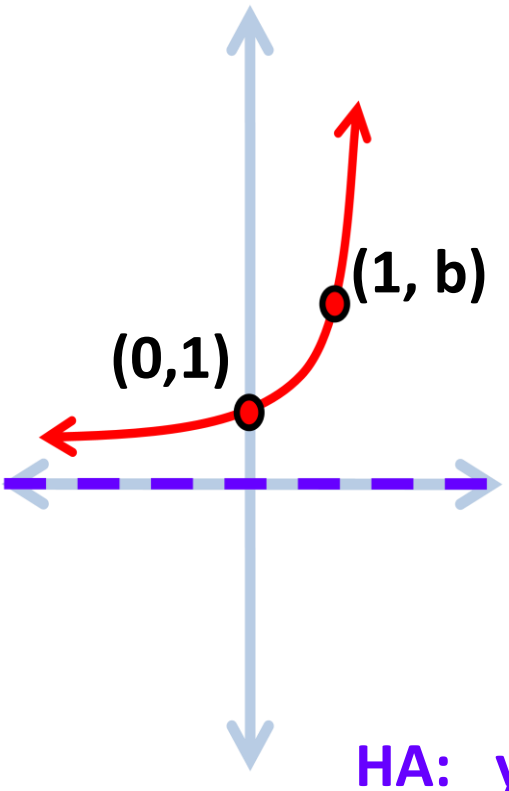
Exponential: $y = 2^x$

$$y = a \cdot b^{(x-h)} + k$$

$f(x) = b^x$

where b > 1

exponential growth



HA: y = 0

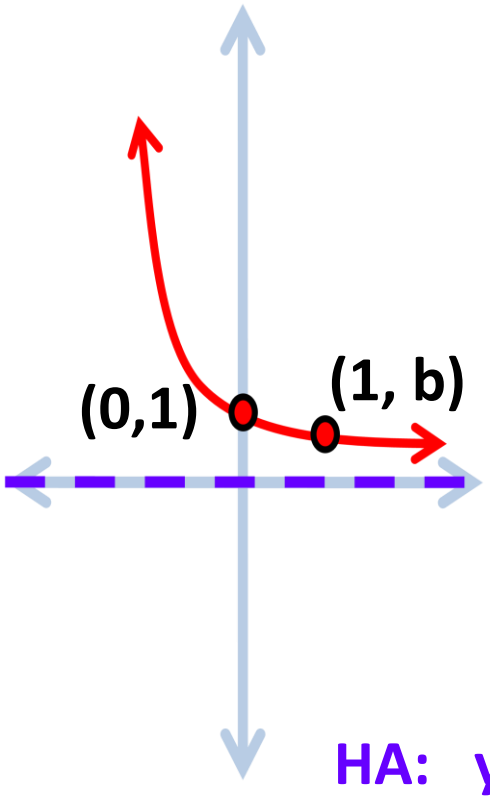
D: (-∞, ∞)

R: (0, ∞)

$f(x) = b^x$

where 0 < b < 1

exponential decay



HA: y = 0

D: (-∞, ∞)

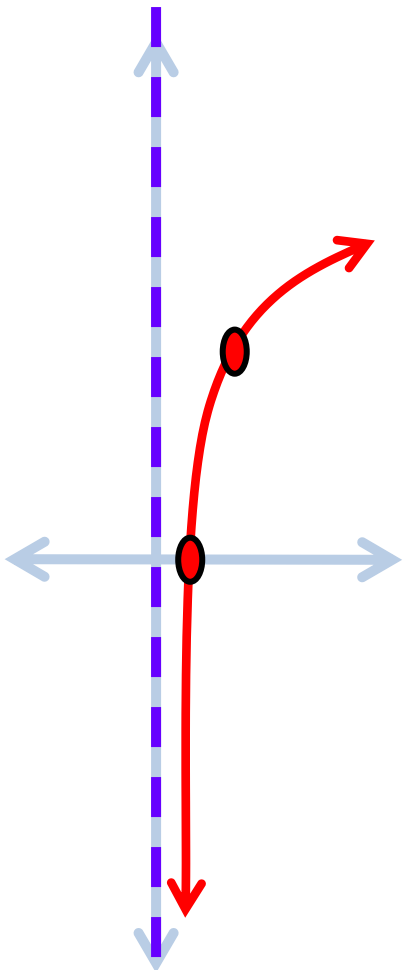
R: (0, ∞)

Logarithmic: $y = log\ x$

$f(x) = log\ x$ **logarithm base 10**

$f(x) = ln\ x$ **$\log_e x$**

natural logarithm



D: $(0, \infty)$

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

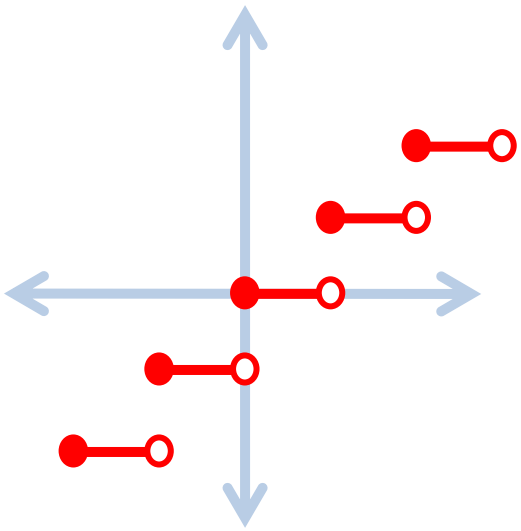
VA: x = 0

Greatest Integer: $y = int\,(x)$

$$y = a \cdot int(x - h) + k$$

or

$$y = a \cdot \lfloor x - h \rfloor + k$$



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

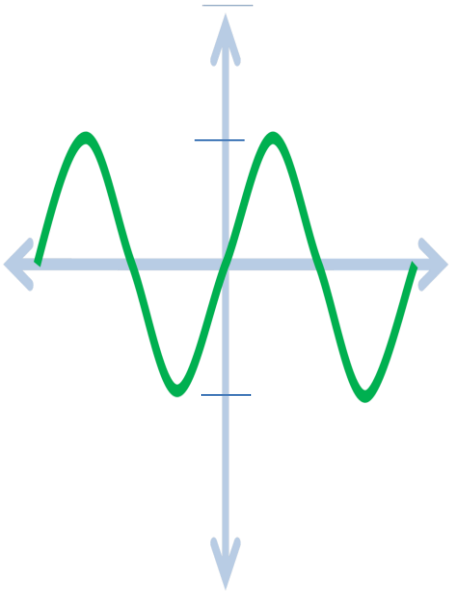
R: $\{\ldots -2, -1, 0, 1, 2, \ldots\}$

integers

Sine/Cosine: $y = sin\ x$ or $y = cos\ x$

Sine function

$f(x) = sin\ x$



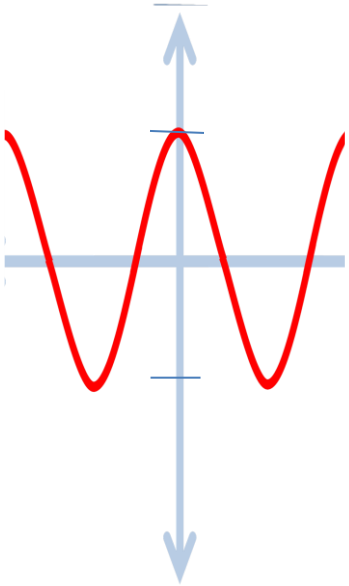
D: $(-\infty, \infty)$

R: $[-1, 1]$

Odd function
b/c symmetric
about origin

Cosine function

$f(x) = cos\ x$



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

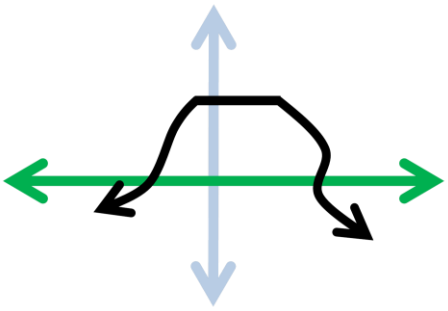
R: $[-1, 1]$

Even function
b/c symmetric
about y-axis

Attributes of Functions

Domain: x values

How far **left and right** does the graph go?

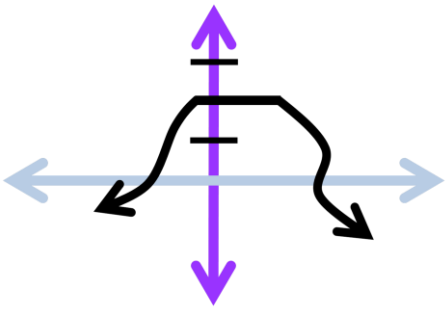


(left, right)

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

Range: y values

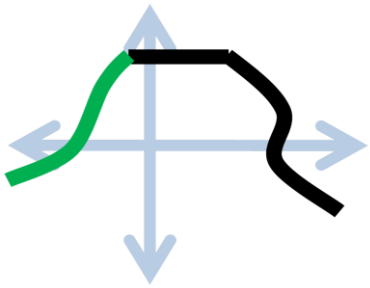
How **low and high** does the graph go?



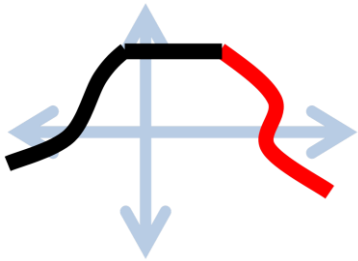
(bottom, top)

R: $(-\infty, 2]$

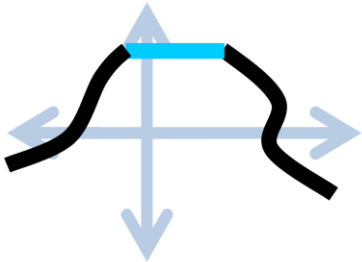
Increasing: graph goes **up** from left to right



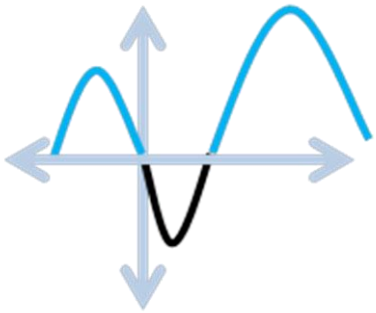
Decreasing: graph goes **down** from left to right



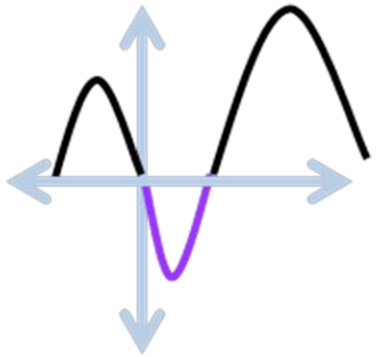
Constant: graph remains **horizontal** from left to right



Positive: the part of the graph **above** the x-axis



Negative: the part of the graph **below** the x-axis



Transformations

Vertical

$y = p(x) + k$ — up k units

$y = p(x) - k$ — down k units

$y = a \cdot p(x)$

a > 1
- vertical stretch
- dilation by a factor of "a"

0 < a < 1
- vertical compression
- dilation by a factor of "a"

$y = -p(x)$ — reflection over x-axis

$y = |p(x)|$

negative y values reflect over x-axis

positive y values remain the same

Horizontal

$y = p(x - h)$ — right h units

$y = p(x + h)$ — left h units

$y = p(b \cdot x)$ — horizontal dilation by a factor of 1/b

$y = p(-x)$ — reflection over y-axis

$y = p(|x|)$

positive x values remain the same

negative x values reflect over x-axis