Welcome Back!

Announcements:

1. Log into REEF and join our course!
2. Try the homework!
   HW01 is due Tuesday.

REEF Question:

What is your favorite ice cream flavor?

Chapter 1 - Day 2

Inverse of a Function

two functions $f(x)$ and $g(x)$ are inverses if $f(g(x)) = x$ and $g(f(x)) = x$

To find an inverse:

1. switch the independent & dependent variables.
2. solve for the dependent variable
3. write the inverse function in terms of the independent variable.

Ex: if $f(x) = 5x + 6$, find $f^{-1}(x)$.

$$y = 5x + 6$$

$$x = 5y + 6$$

$$x - 6 = 5y$$

$$\frac{x-6}{5} = y$$

$$\boxed{f^{-1}(x) = \frac{x-6}{5}}$$

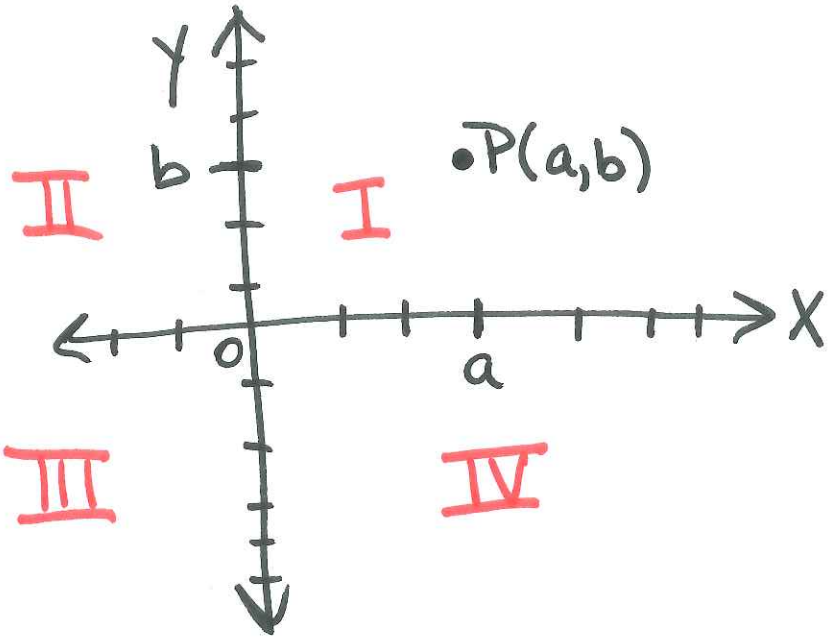
Check: $f(f^{-1}(x)) = 5\left(\frac{x-6}{5}\right) + 6$

$= x - 6 + 6 = x$ ✓

$f^{-1}(f(x)) = \frac{(5x+6)-6}{5}$

$= \frac{5x}{5} = x$ ✓

Cartesian Plane



X-axis labeled X

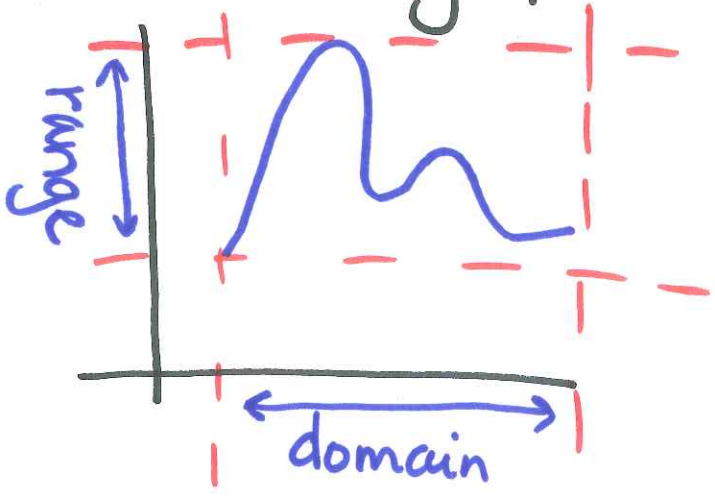
y-axis labeled y

origin labeled o

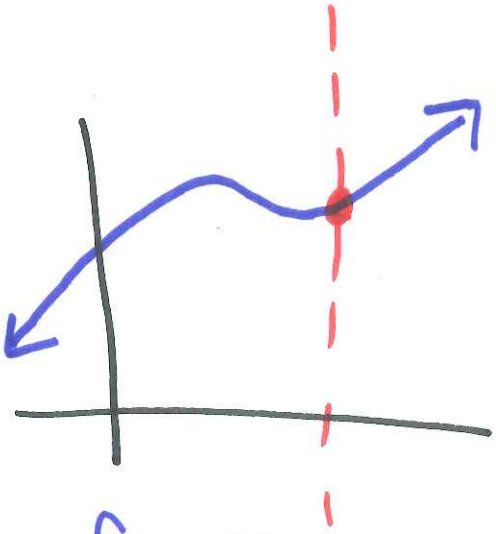
if f is a function with domain A,

then the graph of f = $\{(x, f(x)) \mid x \in A\}$

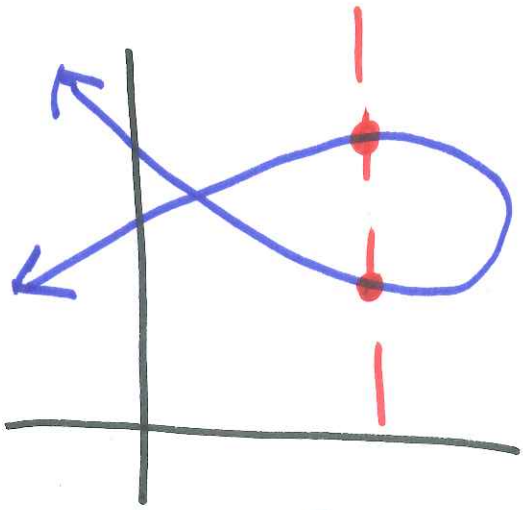
Consider a graph



We can determine if a graph is a function or not by using the vertical line test.



function



not a function

Lines and Linear Functions

the slope of a line through 2 points (x_1, y_1) and (x_2, y_2) can be found by

$$\text{Slope} = m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\Delta y}{\Delta x}$$

Point Slope Form of a line with slope m that passes through the point (x_0, y_0)

$$y - y_0 = m(x - x_0)$$

Slope Intercept Form of a line with slope m and y-intercept b

$$y = mx + b$$

Ex: A linear function f is defined by $f(1)=2$ and $f(4)=\frac{13}{2}$. Find $f(2)$.

$$m=\frac{\Delta y}{\Delta x}=\frac{\frac{13}{2}-2}{4-1}=\frac{\frac{9}{2}}{3}=\frac{9}{6}=\frac{3}{2}$$

use $m=\frac{3}{2}$ if $f(2)=n$

use $(1,2)$ and $(2,n)$ to find slope.

$$m=\frac{n-2}{2-1}=\frac{n-2}{1}$$

$$\frac{3}{2}=n-2$$

$$n=\frac{3}{2}+2=\frac{7}{2}$$

$$\boxed{f(2)=\frac{7}{2}}$$

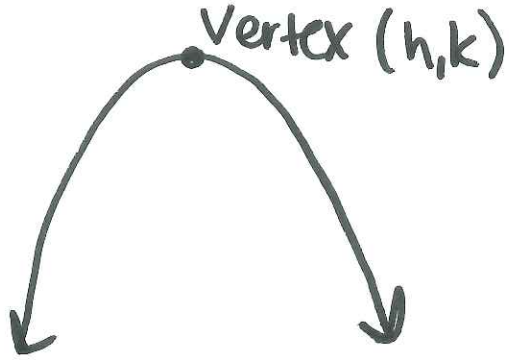
Parabolas and Quadratic Functions

quadratic function $y = ax^2 + bx + c$

for $a, b, c \in \mathbb{R}$, $a \neq 0$

vertex (h, k)

$a > 0$



$a < 0$

vertex form $y = a(x-h)^2 + k$

Ex: Consider $y = x^2 + 2x - 15$

a) Where are the zeros of this function?

$$x^2 + 2x - 15 = 0$$

$$(x+5)(x-3) = 0$$

$$\boxed{x = -5, 3}$$

b) Solve $x^2 + 2x - 15 < 0$

$$(x+5)(x-3) < 0$$

zeros at 3, -5

$$\boxed{-5 < x < 3 \quad \text{or} \quad (-5, 3)}$$

Piecewise Defined Functions -

functions that are defined by multiple rules.

Ex: $f(x) = \begin{cases} x+3 & x < -1 \\ x^2 - 2 & x \geq -1 \end{cases}$