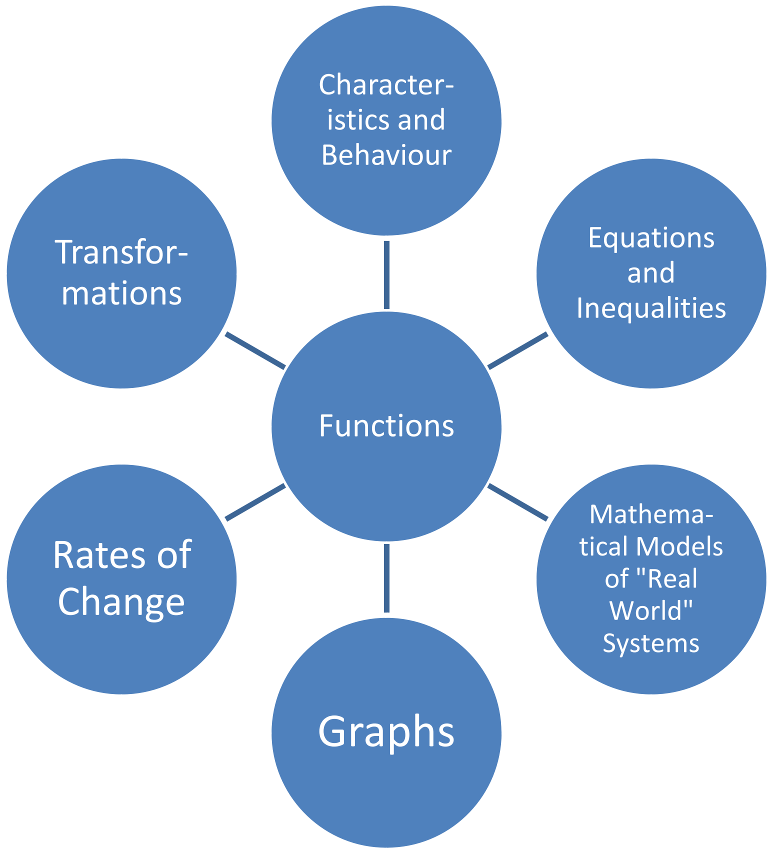
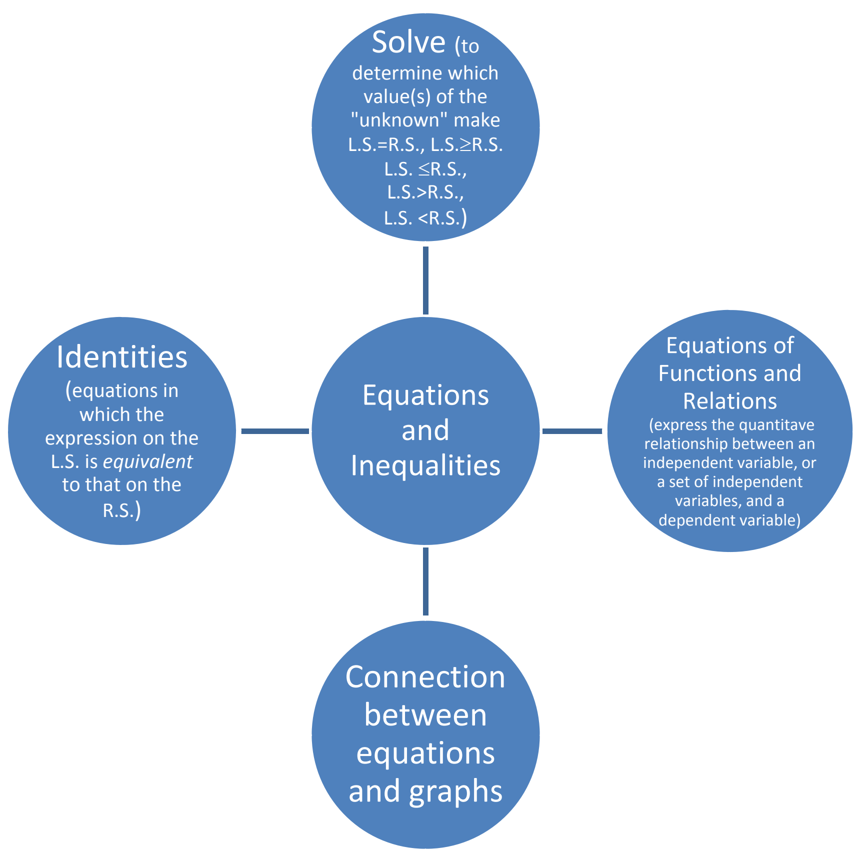
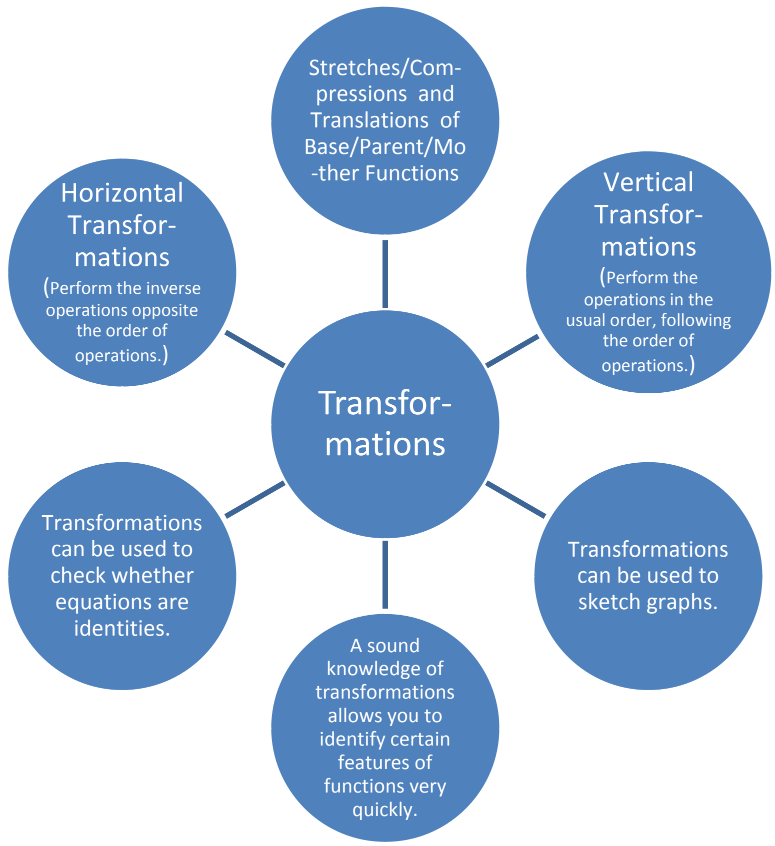
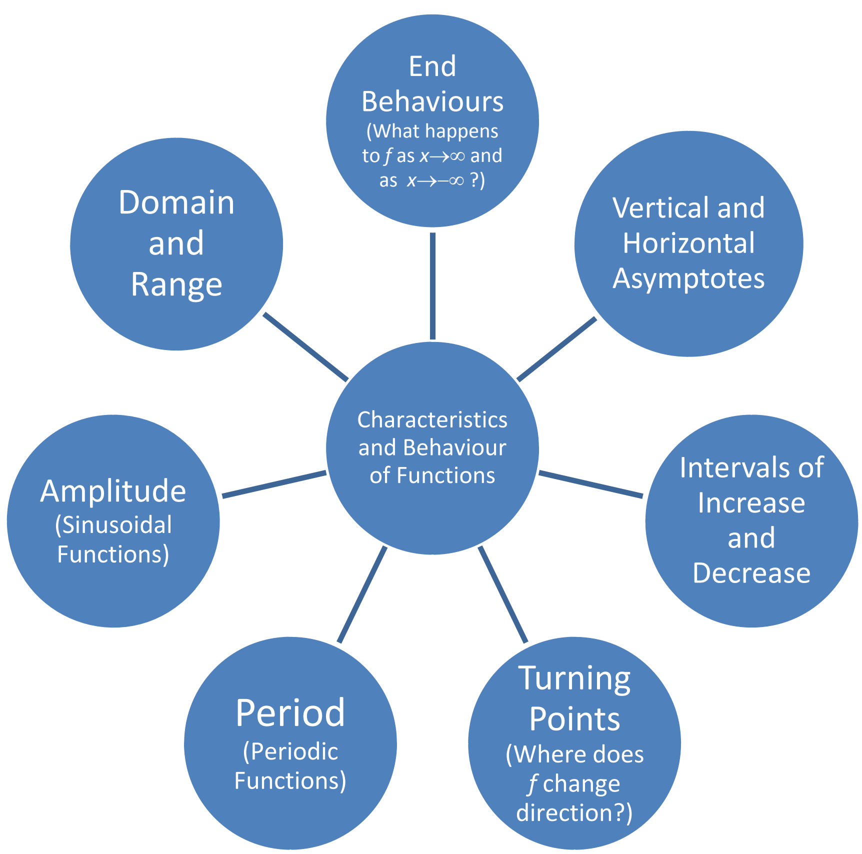
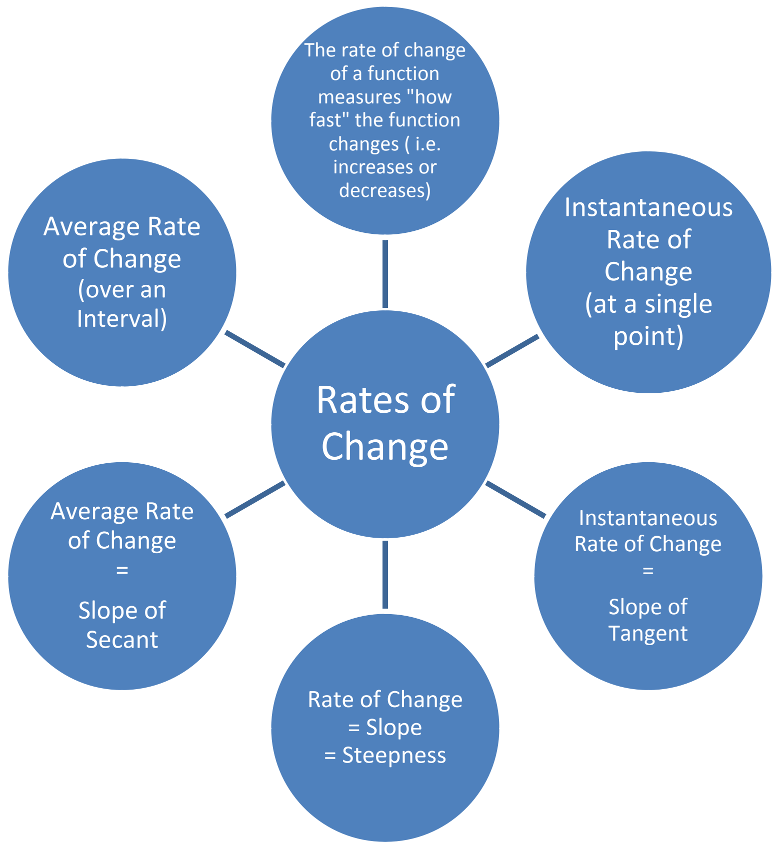
# Conceptual Analysis of MHF4U0

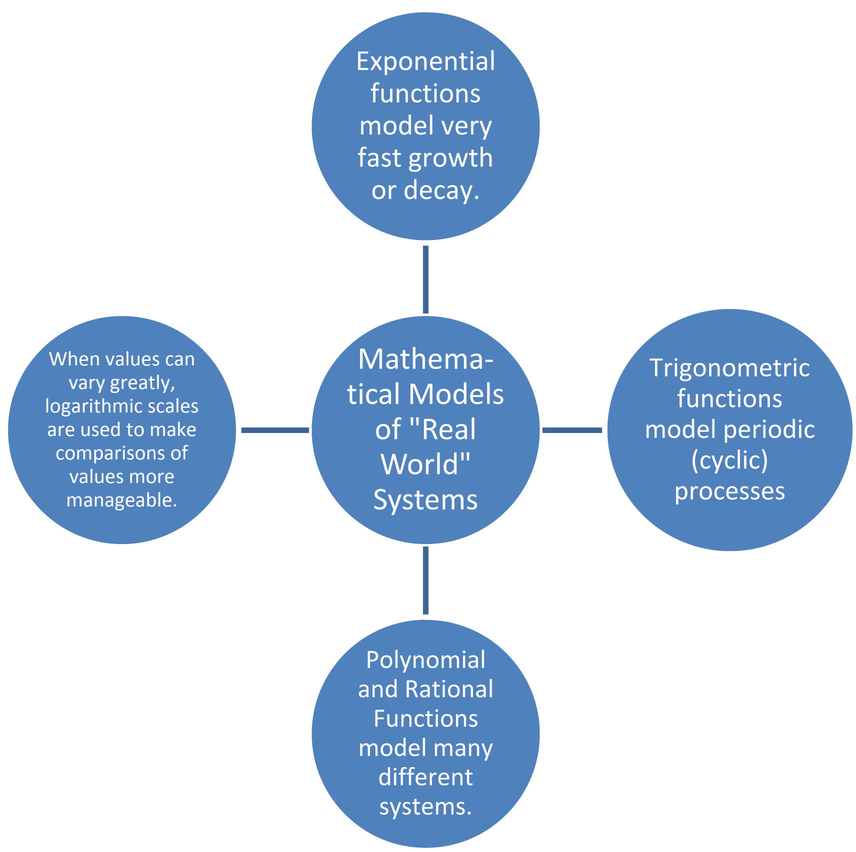



Stretches/Compressions and Translations of Base/Parent/Mother Functions
Horizontal Transformations (Perform the inverse operations opposite the order of operations.)
Vertical Transformations (Perform the operations in the usual order, following the order of operations.)
Transformations
Transformations can be used to check whether equations are identities.
Transformations can be used to sketch graphs.
A sound knowledge of transformations allows you to identify certain features of functions very quickly.


End Behaviours (What happens to $f$ as $x \to \infty$ and as $x \to -\infty$ ?)
Domain and Range
Vertical and Horizontal Asymptotes
Characteristics and Behaviour of Functions
Amplitude (Sinusoidal Functions)
Intervals of Increase and Decrease
Period (Periodic Functions)
Turning Points (Where does $f$ change direction?)


The rate of change of a function measures "how fast" the function changes ( i.e. increases or decreases)
Average Rate of Change (over an Interval)
Instantaneous Rate of Change (at a single point)
Rates of Change
Average Rate of Change = Slope of Secant
Instantaneous Rate of Change = Slope of Tangent
Rate of Change = Slope = Steepness


Exponential functions model very fast growth or decay.
When values can vary greatly, logarithmic scales are used to make comparisons of values more manageable.
Mathema-tical Models of "Real World" Systems
Trigonometric functions model periodic (cyclic) processes
Polynomial and Rational Functions model many different systems.

The concept of ***amplitude*** applies only to the sinusoidal functions (sin and cos).

$f(x)=\mathbf{A}\sin(\boldsymbol{\omega}(x-\mathbf{p}))+\mathbf{d}$

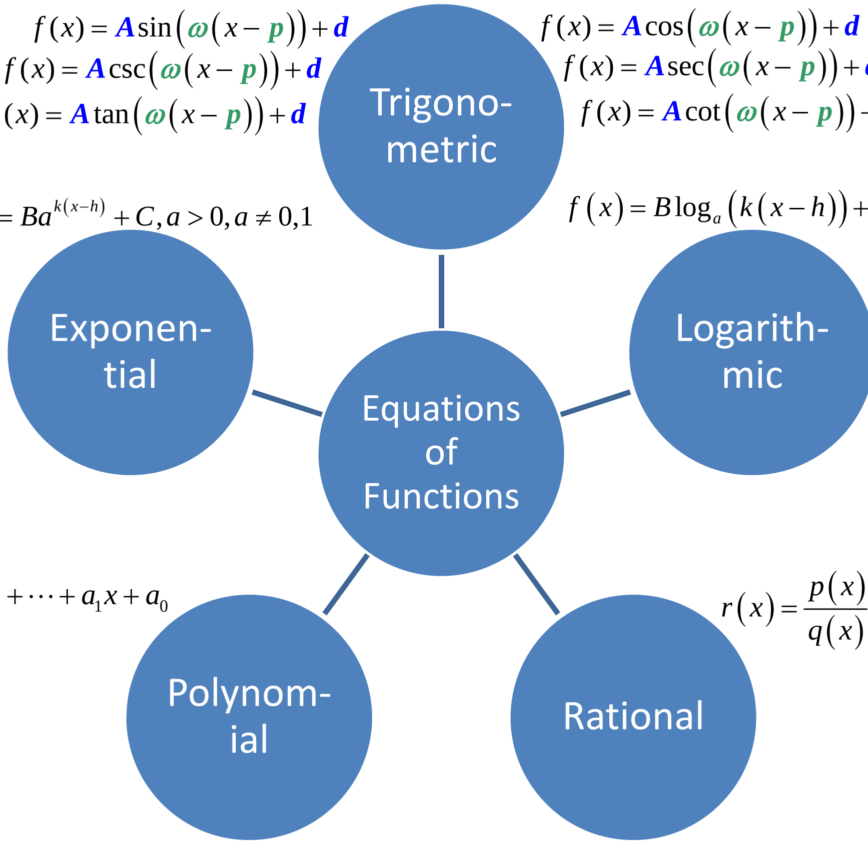
$f(x)=\mathbf{A}\csc(\boldsymbol{\omega}(x-\mathbf{p}))+\mathbf{d}$

$f(x)=\mathbf{A}\tan(\boldsymbol{\omega}(x-\mathbf{p}))+\mathbf{d}$

$f(x)=\mathbf{A}\cos(\boldsymbol{\omega}(x-\mathbf{p}))+\mathbf{d}$

$f(x)=\mathbf{A}\sec(\boldsymbol{\omega}(x-\mathbf{p}))+\mathbf{d}$

$f(x)=\mathbf{A}\cot(\boldsymbol{\omega}(x-\mathbf{p}))+\mathbf{d}$

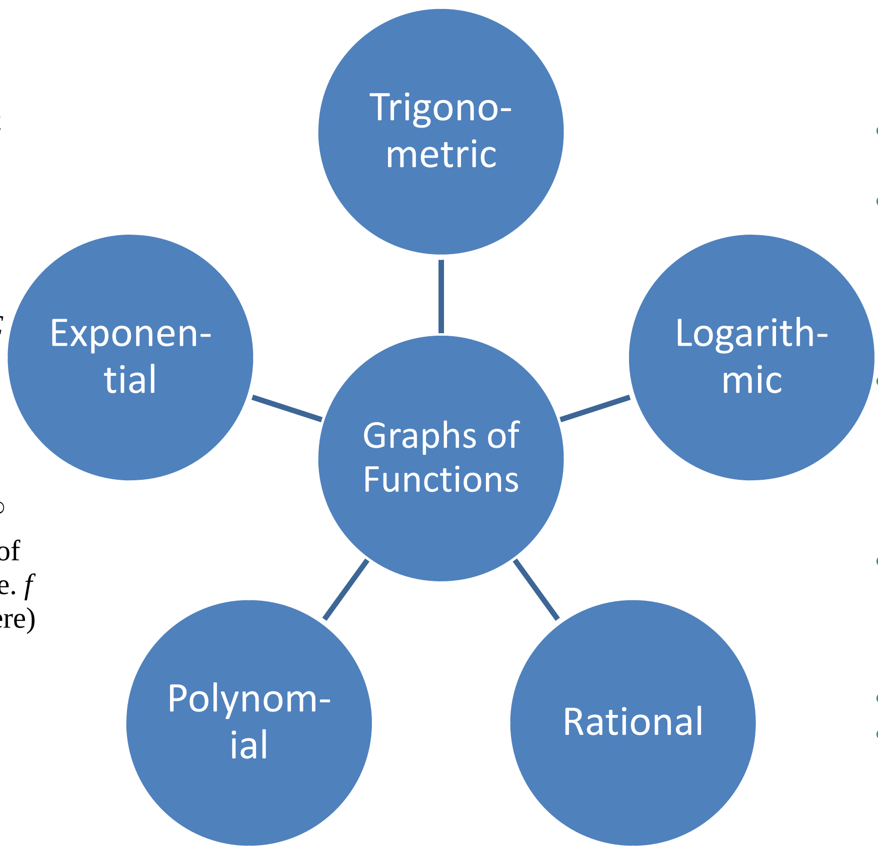



$f(x)=Ba^{k(x-h)}+C, a>0, a\neq 0,1$

$f(x)=B\log_a(k(x-h))+C, a>0, a\neq 0,1$

$p(x)=a_nx^n+a_{n-1}x^{n-1}+\cdots+a_1x+a_0$

$r(x)=\dfrac{p(x)}{q(x)}$, where $p(x)$ and $q(x)$ are both polynomial functions




- Horizontal asymptote at $x=C$
- If $B>0$
  *f* increases on $(-\infty,\infty)$
  As $x\to\infty$, $f(x)\to\infty$
  As $x\to-\infty$, $f(x)\to C$
- If $B<0$
  *f* decreases on $(-\infty,\infty)$
  As $x\to\infty$, $f(x)\to C$
  As $x\to-\infty$, $f(x)\to\infty$
- As *x* increases, the rate of change of *f* increases (i.e. *f* is ***concave up*** everywhere)
- No turning points
- No points of inflection

- Vertical asymptote at $x=h$
- If $B>0$
  *f* increases on $(-\infty,\infty)$
  As $x\to\infty$, $f(x)\to\infty$
  As $x\to h$, $f(x)\to-\infty$
- If $B<0$
  *f* decreases on $(-\infty,\infty)$
  As $x\to\infty$, $f(x)\to-\infty$
  As $x\to h$, $f(x)\to\infty$
- As *x* increases, the rate of change of *f* decreases (i.e. *f* is ***concave down*** everywhere)
- No turning points
- No points of inflection