Polynomial Function Review ($a_n x^n + a_{n-1} x^{n-1} + ... + a_1 x + a_0$)

- Characteristics of a degree *n* polynomial function
  - # of local max/min points (maximum *n-1*)
  - # of zeroes (maximum *n*)
  - end behaviour

- Finite differences – degree *n*
  - *n*th differences are equal
  - value of differences = *a* x *n!*

- Graphing
  - zeroes
  - y-intercept
  - axis of symmetry (even power functions)
  - order of zeroes (cross over *x*-axis if odd)

- Symmetry
  - point symmetry (rotate 180° around a point)
  - line symmetry (reflect in a vertical line)

- Slopes of Secants (average rate of change)
  - $m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$)

- Even Function
  - $f(-x) = f(x)$
  - line symmetry along the *y*-axis

- Odd Function
  - $f(-x) = -f(x)$
  - point symmetry at the origin

- Slopes of Tangents (instantaneous rate of change)
  - pick points on either side of tangent point and calculate slope of secant
  - look for pattern

- Remainder Theorem
  - if you divide $f(x)$ by $(x-a)$, then the remainder is $f(a)$

- Factor Theorem
  - if $f(a) = 0$, then $(x-a)$ is a factor of $f(x)$
  - When *a* is not 1, then can have fractional values

- Long Division/Synthetic Division/Comparing Coefficients

- Solving Polynomial equations
  - factor
  - set factors equal to zero and solve
  - may need quadratic equation

- Solving Polynomial inequalities
  - factor
  - find zeroes and use in a chart, number line, or graph the function

- Families of Polynomial functions
  - all family members have the same zeroes
  - leading coefficient is different for each family member

Rational Functions Review ($y = \frac{f(x)}{g(x)}$)

- To graph, use zeroes, *y*-intercept, asymptotes, behaviour, and points of intersection with the HA/OA

- Asymptotes:
  - Vertical Asymptote
    - occur at the restrictions (where $g(x) = 0$, as long as $f(x) \neq 0$)
    - if numerator and denominator evaluate to zero, then there is a hole!
  - Horizontal Asymptote
    - defined as $x \to \pm\infty$
    - divide by the highest degree of *x*
    - degree of numerator $\leq$ degree of denominator
    - if degree (num) = degree (denom) then asymptote has equation of
      $$y = \frac{\textit{leading coefficient of numerator}}{\textit{leading coefficient of denominator}}$$
    - if degree(num) < degree (denom) then asymptote has equation of
      $y = 0$
    - Horizontal asymptotes can be crossed in the middle of the graph
  - Oblique Asymptote
    - degree (num) = degree (denom) + 1
    - divide numerator by denominator and then evaluate when $x \to \pm\infty$
    - equation of oblique asymptote is *y* = quotient
    - Oblique asymptotes can be crossed in the middle of the graph

- Behaviour
  - Vertical Asymptote
    - notation is $x \to 2^-, y \to +\infty$, etc.
    - test by plugging in a number close to the asymptote (on both sides)
  - Horizontal Asymptote
    - look at where $x \to \pm\infty$, and whether the function is below or above the asymptote
    - test by plugging in a number that is very large (both positive and negative)
  - Oblique Asymptote
    - look at where $x \to \pm\infty$, and whether the function is below or above the asymptote
    - test by plugging in a number, into the function and the equation of the asymptote, that is very large then in a chart, etc. compare this value to the value of the asymptote.

- Remember the chart:

Sign of function	function is above/below the *x*-axis
Sign of tangents	the function is increasing or decreasing
Change in slope of tangents	look at pattern of tangents as you progress through the interval (concavity)

- Rational Equations
  - multiply out the denominator, factor and solve

- Rational Inequalities
  - do not multiply out the denominator
  - use a chart or number line (using the zeroes of both the numerator and denominators)
  - you may use a graph but usually more time consuming!

Trigonometry Review

Topics:

- Radians – conversion
- Angular Velocity $a = r\theta$
- Coterminal Angles – writing angles in terms of an angle between 0° and 90°
- Special Angles
- Related Angle Identities - related to the *x*-axis (CAST Rule)
- Co-function Identities – related to the *y*-axis
- Compound Angle Identities – adding/subtracting
- Double Angle Identities (includes half-angles)
- Proving Trig Identities (Strategies: factoring, common denominator, simplify, use an identity)
- Graphing sin, cos, and tan – using radians, transformations
- Graphing reciprocal functions
- Applications of Trig – ferris wheel, tides, etc.
- Solving trig equations – factoring, double angles, squaring both sides, restrictions, check for extraneous roots!

Exponential and Logarithm Review

- Determining equations of exponential functions given the graphs. – look at intercepts, where $x = 1$, etc.
- Graphing exponential functions (transformations)
- Exponential growth and decay – half-life, etc.
- Changing from logarithmic to exponential form
- Transformations
- Power Law
- Change of Base
- Product and Quotient Laws
- Solving Exponential and Logarithmic equations
- Graphing logarithmic functions (transformations)
- Applications

Combining Functions Review

- Adding/Subtracting Functions - superposition principle, combined domain, even/odd
- Multiplying/Dividing Functions – combined domain with restrictions, even/odd
- Composite Functions – inverses, domain and range, finding equations, order is important!
- Identifying combinations given the graph – general shape, even/odd, zeros, asymptotes, values
- Solving Inequalities