Even Function: Symmetric to the y-axis; f(x) = f(-x); cos(x)

Odd Function: Symmetric to the origin; -f(x) = f(-x); sin(x)

End Behaviour: The behaviour of a function’s ends as they move to ±∞

Even Degree Polynomial End Behaviour: Same end behaviour

Odd Degree Polynomial End Behaviour: Opposite end behaviour

Point of Inflection: Point where the behaviour of a function changes

Multiplicity: When two or more x-intercepts are at a point. Function does not cross axis if multiplicity is even.

Piecewise Function: A function which has multiple sections each with their own equation.

Trigonometric Equation: An equation with the following form a\*sin(bx+c)+d; may involve any function not only sign; a controls the amplitude of the function; b controls period length; c controls horizontal shift; and d controls vertical shift.

Powers of i: In the situation ix if x%4 =1 then ix = i, if x%4=2 then ix = -1, if x%4=3 then ix = -i, and if x%4=0 then ix = 1.

Compound Interest Formula: A = P(1+r/n)nt; A = Amount; P = Principle(initial); R = Rate; N = Number of Times Compounded per Year and T = Time (in years).

Continuously Compounded Interest: A = P(e)rt; A = Amount; P = Principle; R = Rate; T = Time (in years).

Logarithm Formulas:

|  |  |  |  |
| --- | --- | --- | --- |
| Logab + Logac = Loga(bc) | Log­ab + Logac = Loga(b/c) | c\*Logab = loga(bc) | loga0 = 1 |

Factor Theorem: Given x - a and a is a factor of p(x), then the remainder when preforming division is 0.

Fundamental Theorem of Algebra: Any polynomial of degree n has n roots.

Number of Zeroes Theorem: A function defined by degree n has at most n distinct roots.

Rational Zeroes Theorem: For a function define p and q. P is the leading coefficient of the function and q is the coefficient whose variable has a power of 0. The factors of p and q, defined sets a and b corresponding to p and q respectively define all the possible rational roots with the fraction p/q.

Vertical Asymptotes: A vertical asymptote is created when an equation’s line is undefined in both the original and simplified form at a given value.

Point of Discontinuity: A value that gets cancelled out in the simplified form of a polynomial.

Horizontal Asymptote: Horizontal Asymptotes may be determined by the degree of the numerator and denominator with the x-axis being the asymptote if n° < d°; the equation of the horizontal asymptote is the first term of the numerator, a of n, divided by the first term of the denominator, a of d; If n° > d° there is no asymptote.

Oblique Asymptote: A diagonal asymptote that occurs when the degree of the numerator is greater than that of the denominator by 1. Its slope is found by dividing the numerator by the denominator without accounting for remainders.

Trigonometric Functions: sin(x) = OPP/HYP; cos(x) = ADJ/HYP; tan(x) = OPP/ADJ; csc(x) = HYP/OPP;

sec(x) = HYP/ADJ; cot(x) = ADJ/OPP;

Pythagorean Identity: By identifying the equation of the unit circle we find that x2 + y2 = 1, after substituting in cosine and sine we find that sin2 + cos2 = 1 which is the Pythagorean Root Identity.

Trigonometric Identifies List

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Sin2 + Cos2 = 1 | Csc2 = Cot2 + 1 | Sec2 = Tan2 + 1 | Sin(-x) = -Sin(x) | Cos(-x) = Cos(x) |
| Tan(-x) = -Tan(x) | Csc(-x) = -Csc(x) | Sec(-x) = Sec(x) | Cot(-x) = -Cot(x) |  |

Rationalization (Removing discontinuities): For discontinuities resulting form Points of Discontinuity we may remove discontinuities by simplifying the polynomial and then substituting the x-value of the Point of the Point of Discontinuity into the simplified polynomial to find the lim(x->x1) f(x)->f(x1), in other words to rationalize the function. For discontinuities resulting from the asymptotes by finding an expression that is equivalent for the lim(x->x1) by taking the factored form of the expression, taking the term that causes the asymptote and multiplying the polynomial by any form of 1 that will cause that term to disappear from the new polynomial where you thence find the discontinuity’s value.

Sum and Difference Identities:

|  |  |  |
| --- | --- | --- |
| cos(a+b) = cos(a)cos(b)-sin(a)sin(b) | sin(a+b) = sin(a)cos(b)+sin(b)cos(a) |  |
| cos(a-b) = cos(a)cob(b)+sin(a)sin(b) | sin(a-b) = sin(a)cos(b)-sin(b)cos(a) |  |

Law of Sines: Given ▲ABC with sides a, b, and c corresponding to the sides opposite the angles A, B, and C respectively, we can say that .

Half Angle Identities:

|  |  |  |  |
| --- | --- | --- | --- |
|  | |  | |
|  |  | |  |

SSA Number of Triangles/Solution Sets

|  |  |
| --- | --- |
| If A<90° | |
| 0 triangles | sin(B)>1 & a<h<b |
| 1 (right) triangle | sin(B)=1 & a=h & h<b |
| 1 triangle | 0<sin(B)<1 & a ≥ b |
| 2 triangles | 0<sin(B2)<1 & h<a<b |
| If A>90° | |
| 0 triangles | sin(B) ≥ 1 & a ≤ b |
| 1 triangle | 0<sin(B)<1 & a >b |

Matrix: A system of arraigning systems of equations into a box, usually with variables on the left and a constant on the right. As illustrated on the right.

Matrix Row Transformations:

1. Interchange any two rows
2. Multiply and divide the elements of any row by a non-zero real number
3. Replace any row of the matrix by the sum of the elements of that row and a multiple of the elements of another row.

Reduced Row Echelon Form (Diagonal Form): A form of a matrix that involves the values of rows being set in a diagonal pattern as shown on the left. It is very useful for solving matrices.

Gauss-Jordan Method: A method of placing matrices in reduced echelon form by moving column by column and obtaining the necessary values through matrix row transformations.

# of Solutions of a Matrix

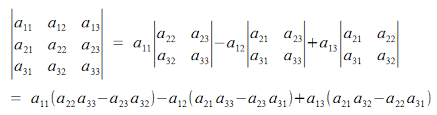
1. If the number of rows with non-zero elements to the left of the constants is equal to the number of variables in the system then the system has 1 solution.
2. If one of the rows has the form [0,0…,0|a] with a≠0
3. If there are fewer rows in the matrix containing non-zero elements than the number of variables then the system has no solution or infinite solutions. If infinite express with regards to one variable i.e. {x,2x}

Determinants of Matrices: For every matrix of form n×n, there exists a number called the determinant, if the matrix is named A then its determinant is expressed as |A| - not to be confused with the absolute value of variable A.

Determinant of a 2×2 Matrix: Given a matrix A, and its values a11 a12 a21 a22 the determinant is a11×a22 – a12×a21.

Elements of a Matrix: The elements of a matrix are named on a coordinate system i.e. the element on the first row and first column would be a11 while the element on the first row and second column would be a12, and so on and so forth.

Determinant of a 3×3 Matrix: See the image below…



Minor of a Matrix: The determinant of each smaller matrix is termed a minor represented by Mij with i representing the eliminated row and j the eliminated column.

Cofactor of an Element of a Matrix: The cofactor of Aij or the element A residing in row i and column j, is found by the equation Aij = (-1)i+j× Mij.

Finding the Determinant of Any n×n Matrix: To find the determinant of any n×n matrix chose a column or row and find the sum of each element multiplied by its cofactor.

Cramer’s Rule for Two Equations in Two Variables: Given the system

if its determinant D ≠ 0 then x = and y = where D =, Dx = , and Dy = .

General Form of Cramer’s Rule: Let an n×n system have linear equations of the form a1x1+a2x2+a3x3,…,anxn=b. D is defined as the determinant of the entire matrix, define Dx1 as the determinant obtained from the system, by replacing first column with the constants of the system. Define Dxi as the determinant obtained from D by replacing the entries in column i with the constants of the system. If D≠0 the unique solution of the system is x1 = , x2 = ,…, xi = .

Determinant Theorems:

1. If every element in a row or column of matrix A is 0, then |A| is 0.
2. If the rows of matrix A are the corresponding columns of matrix B, then |B| = |A|.
3. If any two rows or columns of matrix A are interchanged to from matrix B then |B| = -|A|.
4. Suppose matrix B is formed by multiplying every element of a row or column of matric A by the real number k, then |B| = k\*|A|.
5. If two rows or columns of a matrix A are identical then |A| = 0
6. Changing a row or column of a matrix by adding it to a constant multiplies by another row/column does not change the determinant of a matrix.

Partial Fraction Decomposition: The process of finding the rational functions that when summed equal the initial rational function.

1. If is not a proper fraction, divide f(x) by g(x).
2. Factor the denominator g(x) completely into fractions of the form (ax+b)m or (cx2+dx+e)n where cx2+dx+e is irreducible, and m and n are positive integers.
   1. For each linear factor (ax+b) the decomposition must include the term .
   2. For each repeated linear factor (ax+b)m, the decomposition must include the terms
   3. For each distinct quadratic factor (cx2+dx+e), the decomposition must include the term .
3. Use algebra to solve for the constants in the numerators of the decomposition.
   1. Multiply both sides of the resulting rational equation by the common denominator
   2. Substitute the zero of each factor in the resulting equation. For repeated linear factors, substitutes as many numbers as necessary to find all the constants in the numerators. The number of substitutions required will be equal the number of constants.

Law of Cosines: Given ▲ABC with sides a, b, c corresponding to the side opposite the angle we can say that: a2 = b2 + c2 -2bc(cosA), b2 = a2 + c2 -2ac(cosB), c2 = a2 + b2 – 2ab(cosC).