Even Function: A function which is symmetric to the y-axis. It is defined by the equation f(x) = f(-x).

Odd Function: A function which is symmetric to the origin. Its terms have opposite signs.

End Behaviour of a Function: The behaviour defined between the relation as x -> ∞, f(x) -> ∞.

End Behaviour of Polynomials: Polynomials of an even degree have the same end behaviour while polynomials of an odd degree have different end behaviour.

Point of Inflection: The point where the behaviour of a function changes.

Multiplicity: When a function has 2 or more x-intercepts overlapping at one point. If the number of x-intercepts overlapping the point is even, then the function does not cross the x-axis.

Piecewise Function: A function which has multiple sections with differing equations governing certain domains.

Standard Sinusoidal Equation: The standard sinusoidal equation is of the form , where ***a*** determines the amplitude, ***b*** determines the period length, ***c*** determines the horizontal shift, and ***d*** determines the vertical shift.

Behaviour of i to Differing Powers: Given an expression of the form 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: If ***A*** represents the amount, ***P*** represents the principle, ***r*** represents the rate, ***n*** represents the interest period, and ***t*** represents the time passed, then the formula applies.

Continuously Compound Interest Formula: If ***A*** represents the amount, ***P*** represents the principle, ***r*** represents the rate, and ***t*** represents the time, then the formula applies.

Logarithmic Formulae: The following formulae applying when dealing with logarithmic functions- , , , and .

Factor Theorem: If x = 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.

Rational Zeros Theorem: For a function define ***p*** and ***q***, with ***p*** being the leading coefficient of the function and ***q*** being the coefficient of the term whose variable has a power of 0. The factors of ***p*** and ***q***, defined sets ***a*** and ***b*** respectively, in the form denote all the possible rational roots of the function.

Point of Discontinuity(POD): A point where a function is undefined, but does not change the behaviour of the function. This trait is due to it being able to be removed by simplifying the function.

Removing Discontinuities(Rationalisation): To remove discontinuities in a function manipulate the function by multiplying the numerator or denominator by a conjugate or by factoring out polynomials in either the numerator of denominator to find portions you can simplify.

Asymptote: A line where a function approaches from both positive and negative infinity on either side, but it never reaches.

Vertical Asymptote: An asymptote parallel or on the y-axis. It is created when a function is undefined in both its original and simplified form at a given value.

Horizontal Asymptote: An asymptote parallel or on the x-axis. They are present in all rational functions and may be determined by the relation of the numerator’s degree to the denominator’s degree. If the numerator’s degree is less than the denominator’s then the asymptote is on the x-axis. If the numerator’s degree is equal to the denominator’s then the asymptote is along the line equal to the leading coefficient of the numerator over that of the denominator. If the numerator’s degree is greater than that of the denominator then there is no horizontal asymptote.

Oblique Asymptote: A diagonal asymptote that is found when the degree of the numerator of a rational function is one greater than the degree of the denominator of a rational function. Its slope is found by dividing the numerator by the denominator and taking the resulting linear equation apart from the remainder.

Trigonometric Functions: Trigonometric functions represent the relationship between the side lengths and the angle of a right triangle. Here are the relations of those trigonometric functions- .

Pythagorean Identity: By identifying the equation of the unit circle as and substituting in cosine for x and sine for y, we find the identity which is known as the Pythagorean identity.

Figure I-Compilation of Trigonometric Functions

Law of Sines: Given ▲ABC with sides a, b, and c opposite the corresponding angle we can say that .

Law of Cosines: Given ▲ABC with sides a, b, and c opposite the corresponding angle we can say that: , , and .

Matrix: A system for arraigning numbers in a particular order which represents a transformation of the basis vectors of a coordinate system. This system may be also applied to solving systems of linear equations as shown to the right: .

Matrix Row Transformations: When dealing with a matrix it is possible to transform the rows of a matrix in a variety of ways, listed below:

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 a matrix that involves the values of the row being cancelled out except for a diagonal pattern of 1’s and constants in the final column of the matrix, this form is useful as it gives the values of the various variables of a system of equations.

Figure II-Reduced Row Echelon Form

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

Number of Solutions of a Matrix: The number of solutions of a matrix are given by the criteria listed below-

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 the rows has the form with A ≠ 0, then the system has no solutions.
3. If there are fewer rows in the matrix containing non-zero elements than the number of variables, then the system has no solutions or infinite solution. If infinite solutions, express with regards to one variable, i.e. .

Determinants of Matrices: For matrix of form ***n***x***n*** there exists a number which represents the area or volume of the transformed identity vectors. Given a matrix ***A***, its determinant is ***|A|***, not to be mistaken with absolute value.

Figure III-2x2 Matrix Determinant



Determinant of a 2x2 Matrix: The determinant of a 2x2 matrix is found by multiplying the diagonals together and then subtracting the bottom to top diagonal from the top to bottom diagonal.

Determinant of a 3x3 Matrix: The determinant of a 3x3 matrix is found by eliminating the first column and first row and finding the determinant of the 2x2 matrix remaining, then multiplying that by the value which resides intersection of the removed spaces. The eliminated row is then shifted down and the process is repeated until all rows have been covered. Once this is done, the results of each operation are summed.

Figure IV-3x3 Matrix Determinant

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

Cofactor of an Element of a Matrix: The cofactor of element ***Aij*** = (-1)***i+j*** \* ***Mij.***

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

Cramer’s Rule: Let an ***n***x***n*** matrix named A have linear equations of the form a1x1+a2x2+,…,anxn. |A| is defined as the determinant of the entire matrix. Define |AX1| as the determinant obtained by replacing the first column of A with the constants of the system. Define |Axi| as the determinant obtained by replacing the ith column of A with the constants of the system. If |A| does not equal 0, then the unique solutions of the system are given by, , ,…,.

Determinant Theorems: Below are a number of theorems regarding the behaviour of determinants.

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

Addition and Subtraction of Matrices: To add/subtract matrices of the same size one must add/subtract all corresponding quantities.

Scalar Multiplication: To multiply a matrix by a scalar, multiply each element of the matrix by the scalar.

Matrix Multiplication: Given a matrix A with size ***m***x***n*** and a matrix B with size ***n***x***p***, their product matrix C, has size ***m***x***p*** and the element ***Cij***of the product matrix is equal to ***a11b11+a12b21,…,ainbnj.***

Identity Matrices: A matrix that when multiplied by another matrix, ***A***, keeps the value of ***A*** the same as it was originally. All ***n***x***n*** identity matrices are in Reduced Row Echelon Form.

Inverse Matrices: Given a matrix ***A***, its inverse matrix ***A-1*** fulfils the equation A\*A-1=1.

Finding an Inverse Matrix: To find an inverse matrix follow the steps below-

1. Form the augmented matrix [A|In] where In is the ***n***x***n*** identity matrix.
2. Perform row transformations on [A|In] to obtain a matrix of the form [In|B].
3. Matrix B is A-1.

Using Inverse Matrices to Solve a System of Equations: Given a system of equations, we may rewrite the system as [A] \* . This system may be termed AX = B, which may then be reduced to X = A-1B.

Partial Fraction Decomposition: The process of finding the rational functions that when summed equals the initial rational function. This is done by following the steps below-

1. If is not a proper fraction, divide f(x) by g(x).
2. Factor the denominator, g(x), completely into factors of the form (ax+b)m or (cx2+dx+e)n, where cx2+dx+e is irreducible, and m and n are positive integers.
3. For each linear factor (ax+b), the decomposition must include the term .
	1. For each repeated linear factor (ax+b)m, the decomposition must include the terms .
	2. To find the value of A or An, multiply both sides of the resulting rational equation by the common denominator and substitute values such that each unique (ax+b) equals 0. Then proceed to substitute the values you found for A until a solution is found. The number of substitutions required will equal the number of constants,
4. For each quadratic factor (cx2+dx+e), the decomposition must include the term .
	1. For each repeated quadratic term (cx2+dx+e)n, the decomposition must include the terms .
	2. To find the value of Bx+C or Bnx+Cn, multiply both sides of the resulting rational equation by the common denominator and collect like terms, equate the coefficients of like terms to get a system of equations, and solve the system to find the constants.

Fundamental Theorem of Linear Programming: The optimum value for a linear programming problem occurs at a vertex of the region of viable solutions.

Heron’s Formula: If a triangle has side lengths a, b, and c, then its semi-perimeter ***s*** = . Its area then is given by A = .

Conic Sections: A group of curves that are characterised by being the intersection of a cone with a plane.

Parabola Definition: The set of points in a plane equidistant from a focus (fixed point) and directrix (fixed line).

Parabola with a Horizontal Axis: The parabola with vertex (h,k) and the horizontal line y=k as its axis, has an equation of x-h = a(y-k)2, with the parabola opening to the right if a > 0 and left if a < 0. This equation is derived from the vertex-intercept form of a quadratic- y = a(x-h)2+ k.