Why

The system (A, b) with

$$A = \begin{bmatrix} 0 & 1 \\ 1 & 2 \end{bmatrix}$$

More generally, what if we encounter a zero?[1]

Definition

Let (C, d) be ordinarily reducible with sequence $C_1, \ldots, C_{m-1}$. The difference between C_k and C_{k-1} for $i = 2, \ldots, m-1$ is that we have subtracted multiples of row k from row $k+1, \ldots, m$ in order to eliminate variables from the equations correspondings to those rows of the system.

To do so, we needed row k, k, and in particular the kkth entry (the *pivot*) of C_{k-1}.

$$\begin{bmatrix} \times & \times & \times & \times & \times \\ & C_{kk}^{k-1} & \times & \times & \times \\ & \times & \times & \times & \times \\ & \times & \times & \times & \times \\ & \times & \times & \times & \times \end{bmatrix} \longrightarrow \begin{bmatrix} \times & \times & \times & \times & \times \\ & C_{kk}^{k-1} & \times & \times & \times \\ & \mathbf{0} & \times & \times & \times \\ & \mathbf{0} & \times & \times & \times \\ & \mathbf{0} & \times & \times & \times \end{bmatrix}$$

Since C was ordinarily reducible, $C_{ii}^{k-1} \neq 0$. Even so, there is no reason why we must use the kth row and column for elimination. We could also introduce zeros in column k by

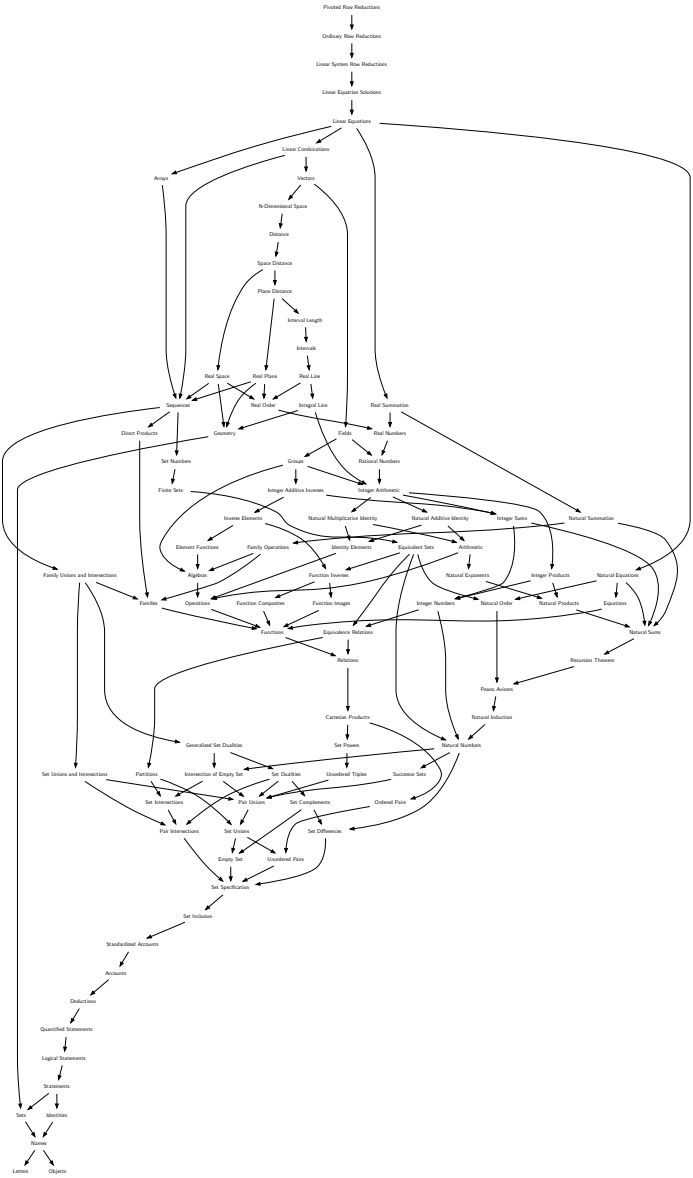
[1] Future editions will expand

reducing other rows $k, \ldots, m$ by multiples of some row i with $k < i \leq m$. For example, if $k = 2$ and $i = 4$,

$$\begin{bmatrix} \times & \times & \times & \times & \times \\ & \times & \times & \times & \times \\ & \times & \times & \times & \times \\ & C_{ij}^{k-1} & \times & \times & \times \\ & \times & \times & \times & \times \end{bmatrix} \longrightarrow \begin{bmatrix} \times & \times & \times & \times & \times \\ & \mathbf{0} & \times & \times & \times \\ & \mathbf{0} & \times & \times & \times \\ & C_{kk}^{k-1} & \times & \times & \times \\ & \mathbf{0} & \times & \times & \times \end{bmatrix}.$$

2

[2]Future editions will complete.


Pivoted Row Reductions
Ordinary Row Reductions
Linear System Row Reductions
Linear Equation Solutions
Linear Equations
Linear Combinations
Arrays
Vectors
N-Dimensional Space
Distance
Space Distance
Plane Distance
Interval Length
Intervals
Real Space
Real Plane
Real Line
Sequences
Real Order
Integral Line
Real Summation
Direct Products
Geometry
Fields
Real Numbers
Set Numbers
Groups
Rational Numbers
Finite Sets
Integer Additive Inverses
Integer Arithmetic
Inverse Elements
Natural Multiplicative Identity
Natural Additive Identity
Integer Sums
Natural Summation
Element Functions
Family Operations
Identity Elements
Equivalent Sets
Arithmetic
Family Unions and Intersections
Algebras
Function Inverses
Natural Exponents
Integer Products
Natural Equations
Families
Operations
Function Composites
Function Images
Integer Numbers
Natural Order
Natural Products
Equations
Functions
Equivalence Relations
Natural Sums
Relations
Recursion Theorem
Peano Axioms
Natural Induction
Cartesian Products
Generalized Set Dualities
Set Powers
Natural Numbers
Set Unions and Intersections
Partitions
Intersection of Empty Set
Set Dualities
Unordered Triples
Successor Sets
Set Intersections
Pair Unions
Set Complements
Ordered Pairs
Pair Intersections
Set Unions
Set Differences
Empty Set
Unordered Pairs
Set Specification
Set Inclusion
Standardized Accounts
Accounts
Deductions
Quantified Statements
Logical Statements
Statements
Sets
Identities
Names
Letters
Objects