Computer Lab 2 – Circuits
Dylan Zwick
Example code for solving the example problem.

$A := \langle\langle -1,-1,0\rangle | \langle 1,0,-1\rangle | \langle 0,1,1\rangle\rangle;$

$$\begin{bmatrix} -1 & 1 & 0 \\ -1 & 0 & 1 \\ 0 & -1 & 1 \end{bmatrix} \quad (1)$$

with(*LinearAlgebra*);

[&x, Add, Adjoint, BackwardSubstitute, BandMatrix, Basis, BezoutMatrix, BidiagonalForm, BilinearForm, CharacteristicMatrix, CharacteristicPolynomial, Column, ColumnDimension, ColumnOperation, ColumnSpace, CompanionMatrix, ConditionNumber, ConstantMatrix, ConstantVector, Copy, CreatePermutation, CrossProduct, DeleteColumn, DeleteRow, Determinant, Diagonal, DiagonalMatrix, Dimension, Dimensions, DotProduct, EigenConditionNumbers, Eigenvalues, Eigenvectors, Equal, ForwardSubstitute, FrobeniusForm, GaussianElimination, GenerateEquations, GenerateMatrix, Generic, GetResultDataType, GetResultShape, GivensRotationMatrix, GramSchmidt, HankelMatrix, HermiteForm, HermitianTranspose, HessenbergForm, HilbertMatrix, HouseholderMatrix, IdentityMatrix, IntersectionBasis, IsDefinite, IsOrthogonal, IsSimilar, IsUnitary, JordanBlockMatrix, JordanForm, KroneckerProduct, LA_Main, LUDecomposition, LeastSquares, LinearSolve, Map, Map2, MatrixAdd, MatrixExponential, MatrixFunction, MatrixInverse, MatrixMatrixMultiply, MatrixNorm, MatrixPower, MatrixScalarMultiply, MatrixVectorMultiply, MinimalPolynomial, Minor, Modular, Multiply, NoUserValue, Norm, Normalize, NullSpace, OuterProductMatrix, Permanent, Pivot, PopovForm, QRDecomposition, RandomMatrix, RandomVector, Rank, RationalCanonicalForm, ReducedRowEchelonForm, Row, RowDimension, RowOperation, RowSpace, ScalarMatrix, ScalarMultiply, ScalarVector, SchurForm, SingularValues, SmithForm, StronglyConnectedBlocks, SubMatrix, SubVector, SumBasis, SylvesterMatrix, ToeplitzMatrix, Trace, Transpose, TridiagonalForm, UnitVector, VandermondeMatrix, VectorAdd, VectorAngle, VectorMatrixMultiply, VectorNorm, VectorScalarMultiply, ZeroMatrix, ZeroVector, Zip] **(2)**

$T := Transpose(A);$

$$\begin{bmatrix} -1 & -1 & 0 \\ 1 & 0 & -1 \\ 0 & 1 & 1 \end{bmatrix} \quad (3)$$

$C := \left\langle \langle 1,0,0\rangle \middle| \langle 0,1,0\rangle \middle| \left\langle 0,0,\frac{1}{2}\right\rangle \right\rangle;$

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & \frac{1}{2} \end{bmatrix} \tag{4}$$

$B := T.C.A;$

$$\begin{bmatrix} 2 & -1 & -1 \\ -1 & \frac{3}{2} & -\frac{1}{2} \\ -1 & -\frac{1}{2} & \frac{3}{2} \end{bmatrix} \tag{5}$$

$c := \langle 4, 0, -4 \rangle;$

$$\begin{bmatrix} 4 \\ 0 \\ -4 \end{bmatrix} \tag{6}$$

 # Note that the matrix B is singular, so we can't invert it.

B^{-1}

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Error, (in rtable/Power) singular matrix
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 # So, we can't solve this by finding an inverse. This is not surprising, as the nullspace of A was one–dimensional.

 # We need to use Maple's "solve" command.

$eqn1 := 2 \cdot v1 - v2 - v3 = 4;$

$$2\, v1 - v2 - v3 = 4 \tag{7}$$

$eqn2 := -v1 + \left(\frac{3}{2}\right) \cdot v2 - \left(\frac{1}{2}\right) \cdot v3 = 0;$

$$-v1 + \frac{3}{2}\, v2 - \frac{1}{2}\, v3 = 0 \tag{8}$$

$eqn3 := -v1 - \left(\frac{1}{2}\right) \cdot v2 + \left(\frac{3}{2}\right) \cdot v3 = -4;$

$$-v1 - \frac{1}{2}\, v2 + \frac{3}{2}\, v3 = -4 \tag{9}$$

$eqn4 := v3 = 0;$

$$v3 = 0 \tag{10}$$

$solve(\{eqn1, eqn2, eqn3, eqn4\}, \{v1, v2, v3\});$

$$\{v1 = 3, v2 = 2, v3 = 0\} \tag{11}$$

#So, our solutions is v1 = 3, v2 = 2, and v3 = 0.