Some useful formulas in and around linear algebra

Rotations

$A_\theta = \begin{pmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{pmatrix}$

Values of Trigonometric functions

θ	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$
sin	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
cos	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0

Linear systems

Consistency of $A\mathbf{x} = \mathbf{b}$: $\mathbf{b} \in \text{Span}(\mathbf{a}_1, \ldots, \mathbf{a}_n)$.

Back and forth substitution:
$L\mathbf{y} = \mathbf{b}; U\mathbf{x} = \mathbf{y}; LU\mathbf{x} = \mathbf{b}$
$U = E_k \cdots E_1 A$: $L = E_1^{-1} \cdots E_k^{-1}$

Elementary row operations: multiply by elementary matrices on the left.

Matrix algebra

$(AB)^T = B^T A^T$
$A \cdot (c_1\mathbf{u}_1 + c_2\mathbf{u}_2) = c_1 A\mathbf{u}_1 + c_2 A\mathbf{u}_2$
$(AB)^{-1} = B^{-1}A^{-1}$
$(A^T)^{-1} = (A^{-1})^T$

Inversion Algorithm: $[A \quad I] \to [I \quad A^{-1}]$

To write an invertible matrix A as a product of elementary matrices: (1) $E_k \cdots E_1 A = I$ (row reduction to reduced row echelon form); (2) $A = E_1^{-1} \cdots E_k^{-1}$.

Linear Correspondence Principle
Any linear relations among the *columns* of a matrix are unaffected by elementary *row* operations.