# The start of linear algebra : linear combination

**Def:** Let $A$ and $B$ be matrices of the same dimensions and let $\alpha$ and $\beta$ be numbers (aka scalars)

WE CAN DO

- matrix addition $A+B$ (add entries)
- scalar multiplication $\alpha A$ (multiply each entry of $A$ by $\alpha$)

PUT TOGETHER

- linear combination $\alpha A + \beta B$

**Ex:** $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} 4 & 3 \\ 0 & 0 \end{bmatrix}$

scalar multiplication: $\sqrt{2}A = \begin{bmatrix} \sqrt{2} & 2\sqrt{2} \\ 3\sqrt{2} & 4\sqrt{2} \end{bmatrix}$

matrix addition: $A+B = \begin{bmatrix} 1+4 & 2+3 \\ 3+0 & 4+0 \end{bmatrix} = \begin{bmatrix} 5 & 5 \\ 3 & 4 \end{bmatrix}$

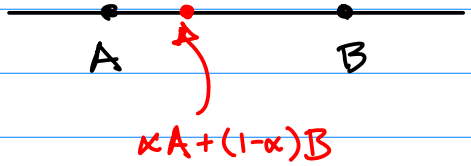
linear combination: $2A+3B = \begin{bmatrix} 2 & 4 \\ 6 & 8 \end{bmatrix} + \begin{bmatrix} 12 & 9 \\ 0 & 0 \end{bmatrix} = \begin{bmatrix} 14 & 13 \\ 6 & 8 \end{bmatrix}$

convex combination: a special kind of linear combination

$\alpha A + (1-\alpha)B$, $0 \le \alpha \le 1$

Intuition

$A, B$ $1\times 1$ matrices (ie numbers)



# Built-in MATLAB functions

Trig functions: sin(x), cos(x), tan(x)
csc(x), sec(x), cot(x)

Exponential / log:
$e^x$ in MATLAB is exp(x)
ln(x) in MATLAB is log(x)
$\log_{10}(x)$ in MATLAB is log10(x)
$\log_2(x)$ in MATLAB is log2(x)

NOTE: can use log(x)/log(b) for $\log_b(x)$

Root functions:
$\sqrt{x}$ in MATLAB is sqrt(x)
$\sqrt[n]{x}$ in MATLAB is nthroot(x,n)

NOTE: can use x^(1/n) for $\sqrt[n]{x}$ also

Stats functions: mean(A), median(A), mode(A), std(A)
By default, it works on each column of a matrix separately, unless running mean(A,2) to switch to rows.