Vectors

- Much of linear algebra and multivariate calculus is in in $\mathbb{R}^n$
  - This is the space of ordered lists of n real numbers
- We are used to working in $\mathbb{R}^2$ and $\mathbb{R}^3$, but higher dimensions are no more complicated
  - The lists of numbers just get larger
- We write the elements of $\mathbb{R}^n$ as columns instead of rows, to be consistent with notation of $f(x)$
- We can interpret lists of numbers as either points or vectors
  - If the list represents some absolute state or position, it is a point
    - The position of some object, the current stock prices, the current temperature
  - If it represents a relative change of state, it is a vector
    - For example, a displacement in positions, change in stock prices, change in temperature
- The difference between points and vectors are not just that vectors have direction and magnitude, as some vectors can be 1 dimensional and represent a change in state, and points can have many dimensions and represent a state.
- Points cannot be added, but vectors can