

**Question #16662** What is Rate of change?

**Solution.** There are a few possible meanings. First one is the following, consider some function  $y = y(x)$ , we are to characterize the speed of change of values of  $y$  in some neighborhood of  $x_0$ , so we are to look at quotient  $\frac{y(x_0 + \delta) - y(x_0)}{\delta}$ , if  $\delta$  passes to 0, that is  $x_0 + \delta$  is close to  $x_0$  and the limit  $\lim_{\delta \rightarrow 0} \frac{y(x_0 + \delta) - y(x_0)}{\delta}$  exists, then it is known as derivative of  $y$  or the rate of change. The other possible meaning is if we are to look at discrete time process  $x_n$ , then by the rate of change we mean  $\frac{x_n - x_{n-1}}{x_{n-1}}$  or  $\frac{x_n - x_{n-k}}{x_{n-k}}$  for some  $k < n$ .