



“Men pass away, but their deeds abide”

- Augustin-Louis Cauchy

9.1 Introduction

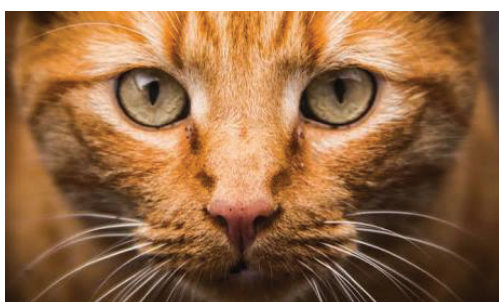
Calculus is about rates of change. Rates of change occur in all the sciences. A **mathematician** is interested in measuring the rate of change of the deviations of a straight line at a point on a curve, while a **physicist** is interested in the rate of change of displacement, and the velocity of a moving object. A **chemist** wants to know the rate of a chemical reaction that would result in the formation of one or more substances (called products) from one or more starting materials (called reactants).

A **biologist** would like to analyse the changes that take place in the number of individuals in an animal population or plant population at any time; he would also want to know the rate at which blood flows through a blood vessel, such as a vein or artery and the part of the vessel / artery in which this flow is lowest or highest.

An **economist** also studies marginal demand, marginal revenue, and marginal profit, which are drawn from rates of change (that is, derivatives) of this demand, revenue and profit functions.

A **geologist** is interested in knowing the rate at which an intruded body of molten rock cools by conduction of heat into surrounding rocks. An **engineer** wants to know the rate at which water flows into or out of a reservoir. An urban **geographer** is interested in the rate of change of population density in a city with the expansion of the city. A **meteorologist** is concerned with the rate of change of atmospheric pressure with respect to height.

In **psychology**, those interested in learning theory, study the so called learning curve, which graphs the performance of someone learning a skill as a function of the training time. Of particular interest is the rate at which performance improves as time passes.



When we enter a darkened room, our eyes adjust to the reduced level of light by increasing the size of our pupils, allowing more light to enter the eyes and making objects around us easier to see. By contrast, when we enter a brightly lit room, our pupils contract, reducing the amount

of light entering the eyes, as too much light would overload our visual system. Researchers study such mechanisms based on limits.

