**Proof of properties of derivatives:**

To prove

(cf)’ = cf’

(fg)’ = f’g + fg’

(f/g)’=(f’g - fg’)/g2

chain rule

use the definition of the derivative through the limit.

To prove (f/g)’=(f’g - fg’)/g2 use the proved product rule with g being 1/g.

**Applications of derivatives** are to find minimum, maximum and stationary points of differentiable functions.

A **stationary point** of a function is where the derivative of the function is equal to zero.

If derivative is negative before the stationary point and positive after, then the stationary point is the point of local **minimum**.

If derivative is positive before the stationary point and negative after, then the stationary point is the point of local **maximum**.

Maxima and minima of the functions are used to find the **best decisions** in real life: for example, maximizing profit of minimizing costs in economics.

Using the concept of the maximum, it is easy to prove that the rectangle with the same perimeter and the **largest possible area is a square**.

Let the distance be at least twice differentiable function of time for any time.

Velocity is a derivative of a distance and acceleration is a derivative of velocity. This means that acceleration is a second derivative of a distance.