Lecture 15

Friday, September 27, 2024 1:00 AM

Yesterday, we found that the slope of the tangent line to the graph of $f(x) = x^2$ at $x = a$ is $f'(a) = 2a$. Can you find the equation of the tangent line at $x = 1$?

Find the tangent lines to the hyperbola $y = 1/x$ at $x = 1,\ x = 2,\ x = 3$.

Ex: Position function of a falling object is $s(t) = \frac{1}{2}gt^2 + v_0t + s_0$, where $g \approx 9.8\ m/s^2$ is the gravitational acceleration, v_0 is the initial velocity, and s_0 is the initial position. Suppose that the initial position is $s_0 = 450$ and initial velocity $v_0 = 0$. What is the velocity after 5 s? How about the velocity right before touching the ground?

Ex: Find the derivative of $f(x) = |x|$ at $x = 0$.

Ex: Find the derivative of $f(x) = x|x|$ at $x = 0$.

An equivalent definition of derivative is

$$f'(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h}$$

We say that f is **differentiable at a** if $f'(a)$ (defined as the limit of a difference quotient) exists. We say that f is **differentiable on an interval** if it is differentiable at every number a in that interval.

Viewing a as a number that can take different values, you are viewing the derivative as a function, not just a number. We only need to alter the notation slightly:

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$