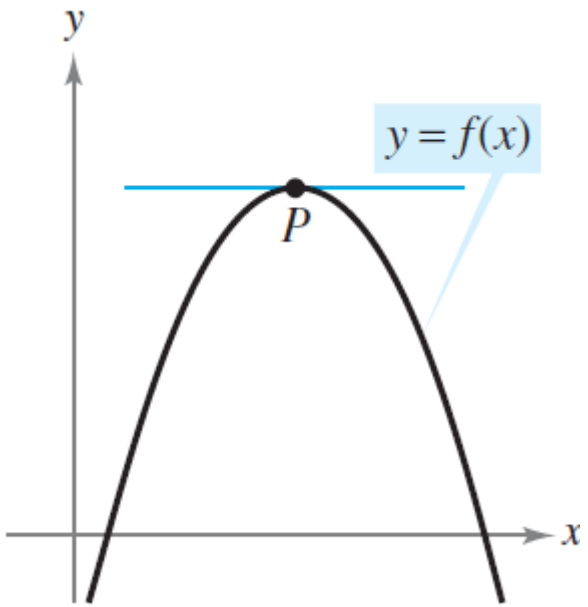
Limit Definition of the Derivative and the Tangent Line

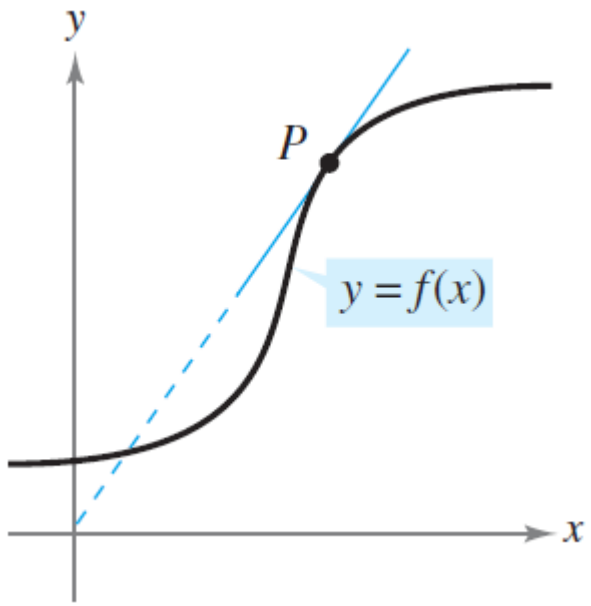
How do we find the slope of a tangent line and what information does it give us?

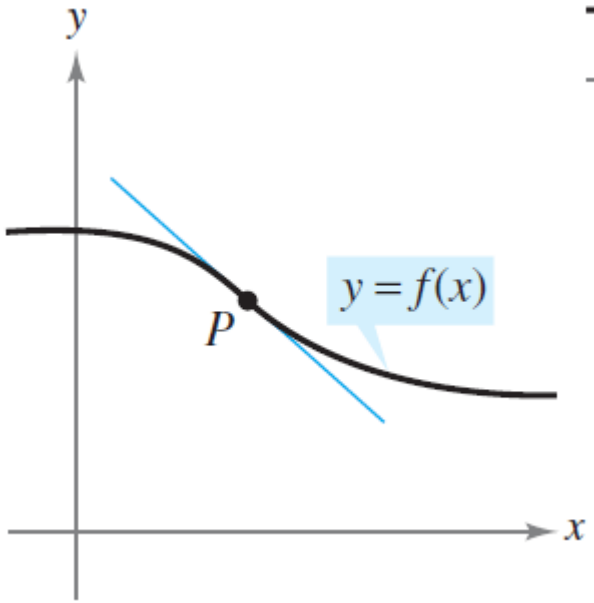
What is a tangent line?

For a circle, the tangent line at P is perpendicular to the radial line (radius) that passes through P.

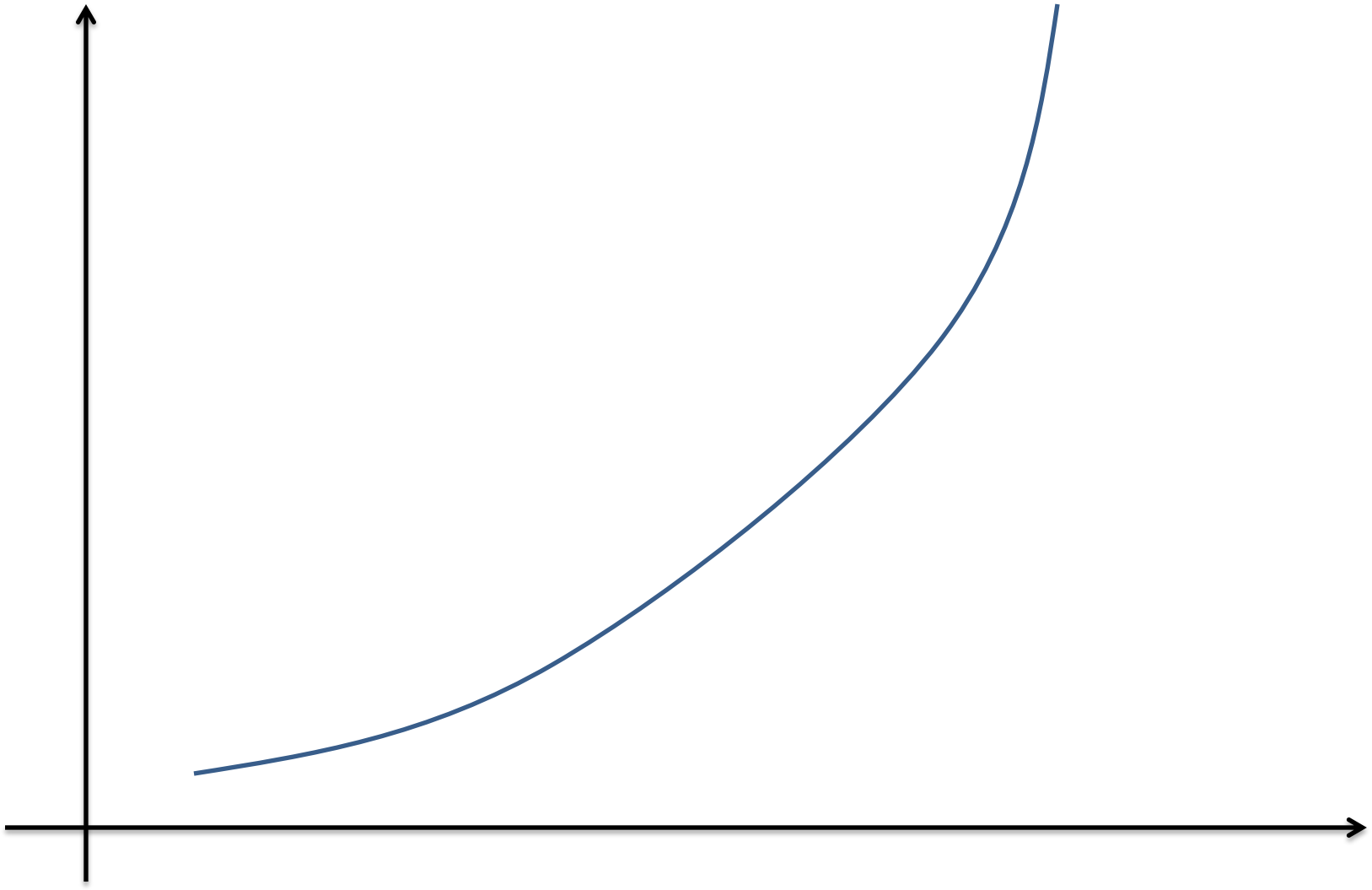
Tangent Lines at a Point



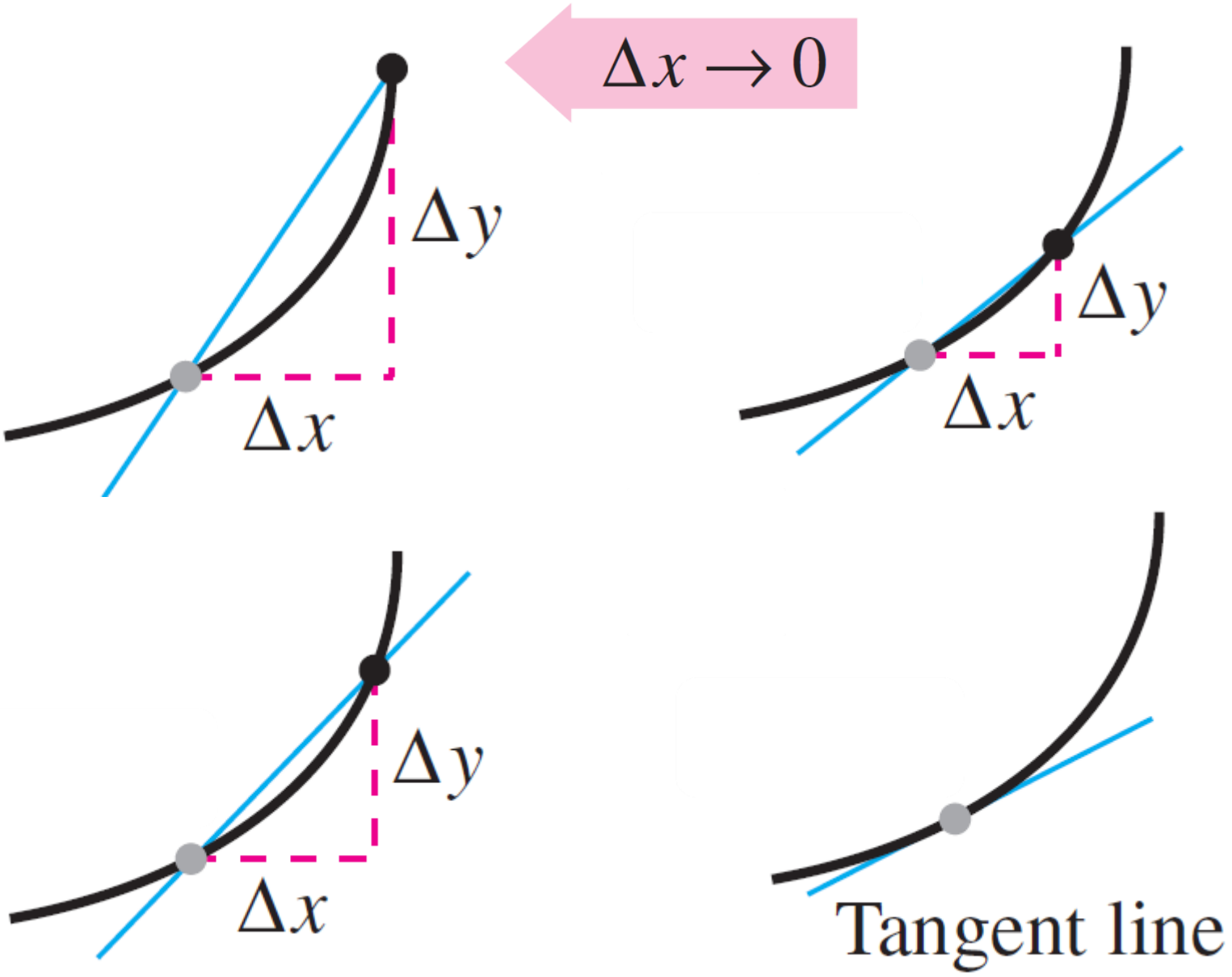




Finding the Secant Line at C.



What happens as Δx gets smaller?



$$\lim_{\Delta x \to 0}$$

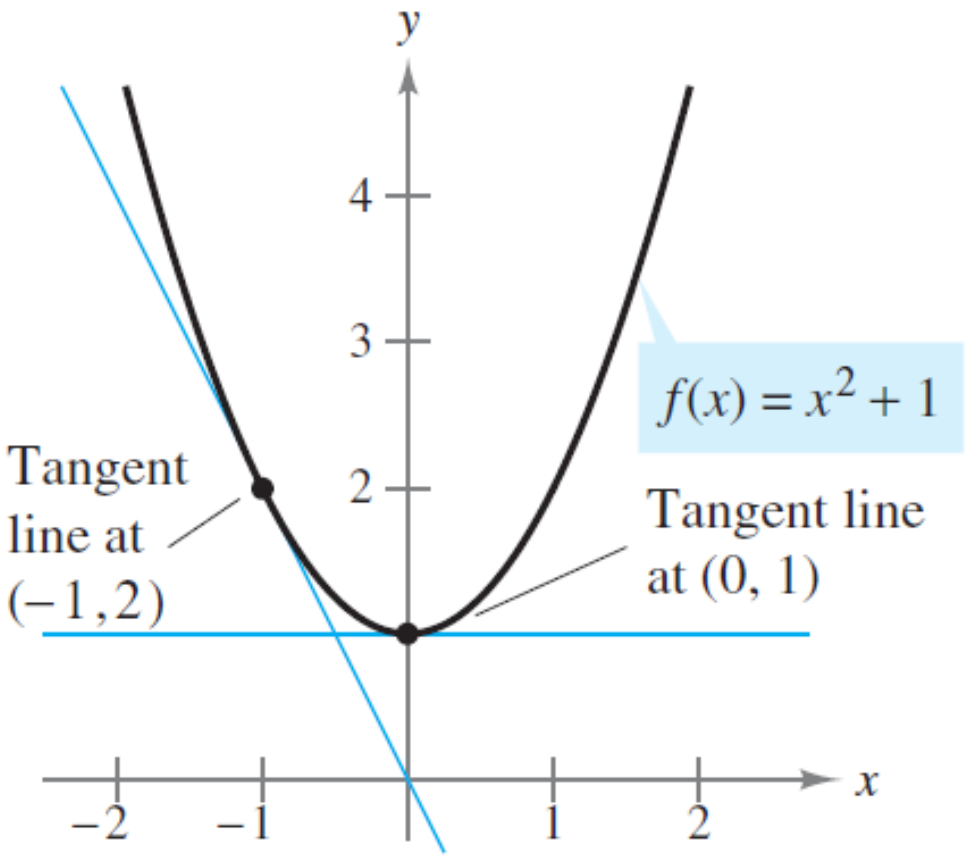
$$\lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x} = \lim_{\Delta x \to 0} \frac{f(x + \Delta x) - f(x)}{\Delta x}$$

This is the slope of the tangent line at any point $(x, f(x))$.

Example 1: Find the derivative of $f(x) = 2x - 3$

Example 2: Find the derivative of $f(x) = x^2 + 1$

Slopes of the tangent lines to the graph $f(x) = x^2 + 1$ at $(0,1)$ and $(-1, 2)$.

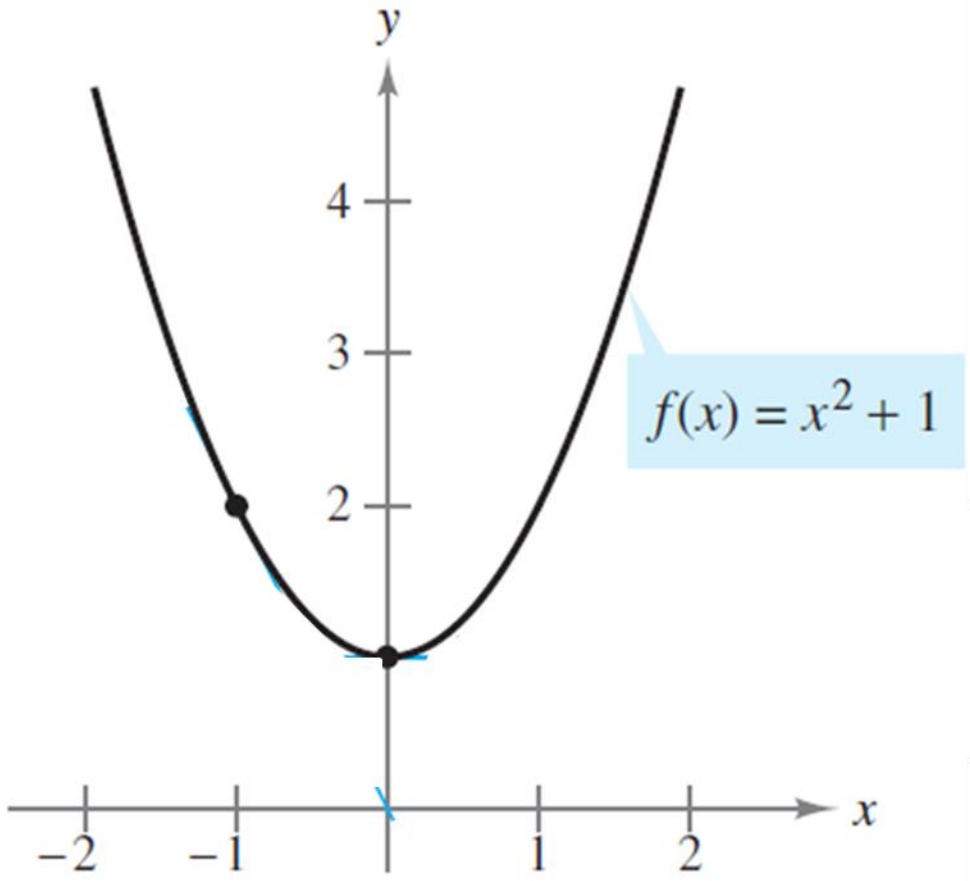


The derivative of the function $f(x) = x^2 + 1$ is $f'(x) = 2x$.

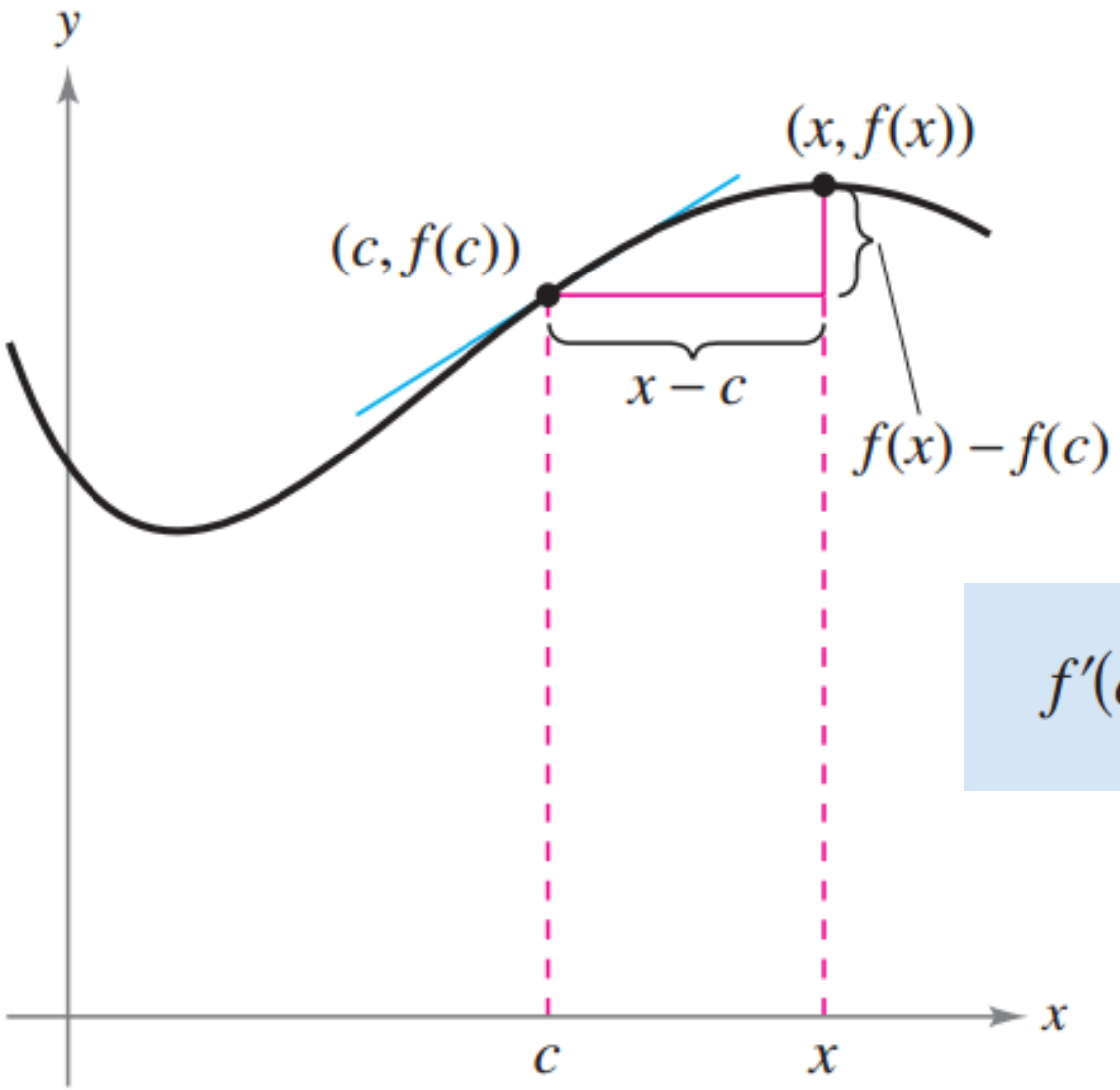
Note that the derivative of the function is also a function.

It allows us to determine the slope of the tangent line at any point on the graph of $f(x)$.

Graph the Derivative



Alternative Definition of the Derivative



$$f'(c) = \lim_{x \to c} \frac{f(x) - f(c)}{x - c}$$

Homework

Section 2.1

P. 104 (11-19, 25-27, odd problems only)

Solutions from links on www.meyersmath.com

Read over Section 2.1

Don't wait until Sunday night to do Homework. You will Forget!!!

(Number 19, Solution wrong, - instead of +)