Derivatives: Inverse Functio

To finalise let us consider the derivative of the **inverse** function
$\arctan x$). The function is called inverse in case its composition
function results into the initial argument:

$$f^{-1} \circ f = x$$

The rule for derivative here is:

$$(f^{-1}(y))' = \frac{1}{f'(x)}$$

Let us use it, e.g., for $\arctan x$:

$$(\arctan x)' = \frac{1}{(\tan(y))'} = \cos^2 y$$

This is nice, but we were hoping for the answer in terms of x, n
remember the main trigonometric mantra:

$$\sin^2 y + \cos^2 y = 1 \quad \Rightarrow \quad \tan^2 y + 1 = \frac{1}{\cos^2 y} \quad \Rightarrow \quad \text{co}$$

Since $y = \arctan x$, $\tan y = \tan \arctan x = x$. Thus

$$(\arctan x)' = \frac{1}{1 + x^2}$$