“What to say in front of the blackboard “

a brief tutorial

Author: Adam Taratuta, I year EPM student

$$[\cos(\arccos(x))]' = -\sin(\arccos(x)) \cdot \frac{-1}{\sqrt{1-x^2}}$$

The derivative of cosine of arc cosine of x.

The most outer function is cosine and it's derivative is minus sine of it's argument.

Next, the inner function is arc cosine of x and its derivative is one over square root of one minus x to the power of two.

$$[\log_3(3^x)]' = \frac{1}{3^x \ln(3)} \cdot [3^x \cdot (\ln 3)] = 1$$

All this simplifies to 1 because $\log_3(3^x) = x$

The derivative of the logarithm of three to the power of x with base three.

First there is the inner function of logarithm of three to the power of x with base three and its derivative is one over three to the power of x times the natural logarithm of three.

Next, the inner function is three to the power of x and I'll write it's derivative three to the power of x times natural logarithm of three.

$$[\arcsin(\arccos(\mathrm{arctg}(x)))]' = \frac{1}{\sqrt{1-(\arccos(\arctan(x)))^2}} \cdot \frac{-1}{\sqrt{1-(\arctan(x))^2}} \cdot \frac{1}{1+x^2}$$

The derivative of arc sine of arc cosine of arc tangent of x.

First, the most outer functions is arc sine the derivative of which is one over the square rot of one minus the arc cosine of arc tangent of x to the power of two.

Next, there is the arc cosine function and its derivative is minus one over the square root of one minus its argument to the power of two.

Finally the most inner function is the arc tangent of x and its derivative is one over one plus x to the power of two.

$$[x^{2x}]' = [e^{\ln x^{2x}}]' = [e^{2x*\ln x}]' = e^{2x\cdot\ln x}\cdot(2x\cdot\ln x)' = e^{2x\cdot\ln x}(2\ln x+2) = x^{2x}\cdot(2\ln x+2)$$

The derivative of x to the power of two x.

First we express our function as the exponent of two times x the natural logarithm of x and we calculate its derivative...

…which is e to the same power times the derivative of its argument.

Using the product rule, we have (after simplification) two times natural logarithm of x plus two…

…which finally gives us x to the power of two x times two natural logarithm of x plus 2.

$$[\text{arcctg}(\text{arctg}(\arcsin(x)))]' = -\frac{1}{1+(\arctan(\arcsin(X)))^2}\cdot\frac{1}{1+(\arcsin(x))^2}\cdot\frac{1}{\sqrt{1-x^2}}$$

The derivative of arc cotangent of arc tangent of arc sine of x.

The most outer function is the arc cotangent its derivative is minus one over one plus its argument to the power of two.

Next, we have the arc tangent function and its derivative is one over one plus its argument to the power of two.

Finally the most inner function is arc sine of x and its derivative is one over square root of one minus x to the power of two.

$$[2^{\ln(\cos x)}]' = 2^{\ln(\cos x)}\cdot\ln 2\cdot(\ln(\cos x))' = 2^{\ln(\cos x)}\cdot\ln 2\cdot\frac{1}{\cos(x)}\cdot(-\sin x)$$

The derivative of two to the power of the natural logarithm of cosine of x.

First, we have a derivative of two to the power of the natural logarithm of cosine x which is two to the power of the natural logarithm of cosine x times natural logarithm of two times the derivative of inner function.

The derivative of inner function is one over cosine x times minus sine of x. So finally we receive two to the power of the natural logarithm of cosine of x times natural logarithm of two times one over cosine of x times minus sine of x.