Answer on Question #52353 – Math – Calculus

Differentiate the following functions:

a) $y(x) = x \ln x$;

b) g(x)=$\frac{x^3-5x}{\cot x}$.

Solution.

a) Using the product rule $(f \cdot g)' = f' \cdot g + f \cdot g'$ and $x' = 1, (\ln x)' = \frac{1}{x}$, we have:

$(x \ln x)' = x' \cdot \ln x + x \cdot (\ln x)' = 1 \cdot \ln x + x \cdot \frac{1}{x} = \ln x + 1.$

b) Using the quotient rule $\left(\frac{f}{g}\right)' = \frac{f' \cdot g - g' \cdot f}{g^2}$ and $(x^n)' = nx^{n-1}$, $(r-s)' = r' - s'$,, $(\cot x)' = -\frac{1}{\sin^2 x}$, we have:

$$\left(\frac{x^3-5x}{\cot x}\right)' = \frac{(x^3-5x)' \cdot \cot x - (x^3-5x) \cdot (\cot x)'}{\cot^2 x} =$$

$$= \frac{(3x^2-5) \cdot \cot x - (x^3-5x) \cdot \left(-\frac{1}{\sin^2 x}\right)}{\cot^2 x} = \frac{3x^2-5}{\cot x} + \frac{x^3-5x}{\cos^2 x} =$$

$$= (3x^2-5) \cdot \tan x + (x^3-5x) \cdot \sec^2 x$$

<u>Answer:</u> a) $\ln(x) + 1$; **b)** $(3x^2-5)\tan(x) + (x^3-5x)\sec^2(x)$.