Answer on Question #85479 – Math – Calculus

Differentiate the following functions w.r.t. x.

Question

i) x ln (x* x) + (sin x)

Solution

i)

We use logarithm power rule $\ln x^y = y\ln x$, the sum rule $(f+g)' = f' + g'$, the product rule $(f \cdot g)' = f' \cdot g + f \cdot g'$ and rules for basic functions $(x^n)' = nx^{n-1}$, $(\ln x)' = \frac{1}{x}$, $(\sin x)' = \cos x$.

$$(x\ln x\, x + \sin x)' = \left(x\ln x^2 + \sin x\right)' = (2x\ln x + \sin x)' = 2\left((x)'\ln x + x(\ln x)'\right) + (\sin x)' =$$

$$= 2\left(\ln x + x \cdot \frac{1}{x}\right) + \cos x = 2\ln x + \cos x + 2$$

Question

ii) sinh (tanh x) −1

Solution

ii)

Here we use the difference rule $(f-g)' = f' - g'$, the chain rule $f\big(g(x)\big) = f'\big(g(x)\big) \cdot \big(g(x)\big)'$ and rules for basic functions $(\sinh x)' = \cosh x$, $(\tanh x)' = \frac{1}{\cosh^2 x}$

$$(\sinh(\tanh x) - 1)' = \sinh'(\tanh x) \cdot (\tanh x)' - 1' = \cosh(\tanh x) \cdot \frac{1}{\cosh^2 x} - 0 = \frac{\cosh(\tanh x)}{\cosh^2 x}$$

Answer:

i) $(x\ln x\, x + \sin x)' = 2\ln x + \cos x + 2$

ii) $(\sinh(\tanh x) - 1)' = \frac{\cosh(\tanh x)}{\cosh^2 x}$